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OR,

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(BEING A CONTINUATION OF THE 'MAGAZINE OF ZOOLOGY AND BOTANY,' AND SIR W. J. HOOKER'S 'BOTANICAL COMPANION.')

CONDUCTED BY

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"Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ: ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomia in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; a vere eruditis et sapientibus semper exculta; male doctis et barbaris semper inimica fuit."—LINN.

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THE ANNALS

MAGAZINE OF NATURAL HISTORY.

I.—*On early Contributions to the Flora of Ireland; with Remarks on Mr. Mackay's Flora Hibernica.* By the Rev. T. D. Hincks, LL.D., M.R.I.A.

To the Editors of the Annals and Magazine of Natural History.

Gentlemen,

Having met with various remarks which seem to imply a peculiar negligence on the part of the Irish in respect of the Natural History of their country, and these remarks having been repeated without any effort to correct them, may I beg permission through your valuable work to make some statements on the subject? As I have for nearly fifty years taken an interest in the botany of Ireland, and as I have had opportunities of knowing many persons who interested themselves about it, I hope I may not be deemed unreasonable, especially as I have no claim of my own to bring forward or any wish to speak lightly of the exertions of late botanists, who I believe would not knowingly claim more than they are fairly entitled to. As these remarks were chiefly suggested by Mr. Mackay's Flora Hibernica, or the reviews of it, I beg to acknowledge my own obligation to him for that work, and to express the esteem and regard I have felt for him for more than thirty years that I have had the pleasure of being acquainted with him.

Different opinions are entertained by botanists as to what a local Flora should be. Remarks on the subject have been made by Prof. Henslow*, attention to which might be of much use; but I cannot blame Mr. Mackay, in the Flora of such an extensive district as Ireland, for having inserted the generic and specific characters, even though he may not have added to those of Sirs J. E. Smith and W. J. Hooker.

The Flora of a country should however do more, it should

* Magazine of Zoology and Botany, vol. i.

I conceive, as far as possible, discriminate between those plants which are really indigenous, and those which appear to have been introduced, whether at an early or a later period; it should mark the situation in which the plant is found and the different parts of the country; whether abundant or scarce; and on what kind of ground, as limestone, basalt, &c. It should be an object to record the *earliest* notice of each plant, and the name of the discoverer, if it can be ascertained, to which may be added remarks on its nature and uses. And in the case of a country like Ireland, which has its own peculiar language still used in many parts of it, the name given to the plant in that language should be recorded, when known, as well as the common names in English. The author of a local Flora should be a man well acquainted with the past as well as present state of the district, and should be able to make various branches of science contribute to the usefulness of his work. Finally, if like Dr. Johnston, in his Flora of Berwick-on-Tweed, he can render his work entertaining as well as instructive, he will have a stronger claim on the gratitude of those for whom he has been labouring. That my friend Mr. Mackay's work does not meet all these objects is no reason for censuring him, and with respect to the Irish names, unless he had it in his power to give *real* ones, it was much better to omit them altogether, than to do, what was done in another case, manufacture names for the occasion, which a native could hardly recognise.

Mr. Mackay's introduction begins with the remark, "It has been matter of complaint that the history of the natural productions of Ireland has hitherto been neglected," but he considers the censure as one of too great severity. The authoress of an "Irish Flora," published about three years before Mr. Mackay's, viz. in 1833, says, "it has been remarked, that when England and France had their provincial Floras, the botany of this island was as much unknown as that of an island in the Pacific; although its peasantry possessed a very considerable knowledge of plants, which is, &c.—but among its enlightened inhabitants it has remained almost a sealed book, while men of science have been occupied investigating other countries not possessing half its richness in vegetable productions." As a proof, the extraordinary deficiency of information in this science, to be met with in the surveys of counties in Ireland, is brought forward, with some exceptions; and be it remarked, that the works excepted were *published*, or at least some of them, before 1750; i. e. eighty years before the time of making the remark. A reviewer of Mr. Mackay's work in the Dublin University Magazine, in a very

interesting article, which proves the information and ability of the writer, except that he knew little of the past state of Ireland, renews the complaint of the *neglect* of the natural history of Ireland, speaks of everything relating to it as only just *beginning*, and compares this with the state of things in Bavaria and Sweden, and then with America. He speaks of the demand for general treatises and the publication of local Floras in England; adding, that "no local Flora has ever been *attempted* in Ireland." Speaking of the progress of the science, he adds, "the valuable result of all is had in England; and among the Scotch almost every town of any magnitude has its museum or botanic garden, or both, and it is but a few years since the only similar establishments in Ireland were those of Dublin—recently the spirited people of Belfast has established both a museum and botanic garden. When Cork or Limerick will choose to follow, where they did not know how to take the lead, we know not." There are not many who are able to detect the errors here fallen into, and which have been of late often repeated, because the greater part of the readers are, like the writer, ignorant of the past; and of what great consequence is it, some may think, if the efforts of earlier times be forgotten? Now as science is progressive, every succeeding period derives advantage from that going before. "No effort is lo t," and it becomes those who are now making rapid advances, to acknowledge the advantages they derive from what their predecessors have done; and such is the *general* feeling, though we occasionally meet with departures from it, arising perhaps more from the ignorance of the writer than from any desire to deprive the dead of any credit to which they were entitled. According to the reviewer no previous publication existed from which Mr. Mackay could obtain any great amount of information respecting our indigenous plants. "The only original work to which he could refer was that of Threlkeld, published more than a century ago, and which is unfortunately merely a catalogue of the more common plants alphabetically arranged, with brief indication of their real or supposed medical virtues. The work of K'Eogh is scarcely deserving of notice, and with one or two exceptions no botanical information was to be obtained from the statistical surveys of the different counties. The task of ascertaining the habitats of rare plants and of discovering new ones, rested almost entirely with the author and his contemporaries." Now somewhat depends on the meaning annexed to contemporaries; and if it includes all who were living at the same time, even those who were going off the stage when Mr. M. came on it, it would include a great many whose principal services to bo-

tany were previous to Mr. Mackay's settlement in Ireland, and were in a great degree a cause of that settlement, to whom I shall afterwards refer. I am willing to take it in that extensive sense, and trust I shall make it appear that Mr. Mackay found much done by them before he saw Ireland. But does not Mr. Mackay in his preface tell us of Molyneux's catalogue of *rare* plants appended to Threlkeld? and previously of Heaton, and Llhwyd and Sherard? Are not some of our rarest plants recorded by Ray? Does not he tell us of Smith's Cork and Kerry? of Wade's Flora Dublinensis and Plantæ Rariores? Does he not refer to a catalogue of the plants of the county Cork by Jas. Drummond? These are mentioned by Mr. Mackay, but considered by his reviewer as absolutely nothing.

Having thus stated the charge brought, that the literary men of Ireland had been peculiarly negligent of her botanical treasures, I shall endeavour to show that it is in great measure not well-founded. It proceeds on the supposition that because a local Flora had not been published, therefore "the botany of Ireland was as much unknown as that of an island in the Pacific." Now we have seen that works were published early in the 18th century, and that references are made to botanists in the 17th century: may we not then look to the comparative state of botany elsewhere? It is well known that for a long period this science was cultivated merely as "the humble but engaging handmaid of surgery and medicine." All the catalogues had a reference to this, except those of timber trees and articles of food. It was not till the latter end of the 17th century, that botany began to make progress as a science, and notwithstanding the valuable labours of Ray and Tournefort, it was not till the establishment of the Linnæan System, about the middle of the 18th century, that there was any work "to enable a botanist by short determinate characters to discover the name of an unknown plant." It is useless then to lament that there was no *Irish* work of this kind, when none existed anywhere. Without urging our ignorance of what may be concealed in Irish MSS; without alleging the change that had so recently taken place in Ireland by the cutting down of woods and the formation of bogs; without dwelling on its wretched internal state, so adverse to all scientific inquiries; it is enough to state that there was a like ignorance of plants in other countries, and that the idea of distinct Floras as guides to students had not been conceived. The earliest works in Ireland, as in England, were chiefly intended to guide the medical practitioner, "the culler of simples," where to find what he wanted. It was not till 1762, when

Hudson published his Flora Anglica, that British botanists had a systematic manual, but are we therefore to regard the works of preceding botanists as useless? An improved edition appeared in 1778, and Lightfoot's Flora Scotica, the first respecting the peculiar botany of Scotland which I have yet traced, appeared in 1777, the work, be it recollected, of an Englishman, at the instigation and even the expense of a native of Wales, Mr. Pennant. From this time the progress of the science was rapid; in 1786 Dr. Withering published his "Botanical Arrangement" in English, and shortly before or soon after commenced Curtis's Flora Londinensis and Botanical Magazine, Smith and Sowerby's English Botany (including Scotland and Ireland), and the Transactions of the Linnæan Society. Previous to 1780 botany could have made little progress in Great Britain, except amongst scientific men, though the dawn of a brighter day of botanical science may be observed in the records of the period immediately preceding. My business however is with Ireland; and I shall first inquire what had been done towards a botanical knowledge of that country previous to 1780; and then whether it accompanied England in its advance, or by unaccountable and shameful neglect, left all to be done, and *by strangers*, within the last few years.

We have no records of the first discoverers, but we know that a Rev. Mr. Heaton communicated the names of plants he had found to How and Merret, and that, probably through him, those plants which at present constitute the most remarkable difference of the Flora of this *island* from that of Great Britian, were known and recorded long before the time of Threlkeld. In 1727 appeared the first list of Irish plants, except what may possibly exist in the Irish language. I will not repeat the slighting terms in which this work is spoken of, but by giving a fuller account of his work, show that the distinguished Robert Brown did not estimate the author of it too highly when he thought him deserving of a place amongst the promoters of botanical knowledge. I allude to the circumstance of his having called a genus of plants by his name, which he would hardly have done if he considered his work so useless as some regard it. The title was "Synopsis Stirpium Hibernicarum, &c. &c., being a short treatise of native plants, especially such as grow spontaneously in the vicinity of Dublin, with their Latin, English, and Irish names, and an abridgement of their virtues, with several new discoveries; with an appendix of observations made upon plants by Dr. Molyneux, Physician to the State in Ireland." The modest motto prefixed is, "Est quiddam prodire tenus si non detur

ultra." The work was dedicated to Primate Boulter. Threlkeld was an Englishman, who settled in Dublin as a physician and dissenting minister. In his preface he speaks of having devoted attention to botanical studies in England as well as since he came to Ireland, and particularly mentions his having been in danger in 1707 (twenty years before the publication of this work) in the neighbourhood of Tynemouth Castle, from having been observed clambering on rocks instead of keeping the high road. He expressly says too, that he collected plants for twelve years, marking the place where they grew, and preserving them in a Hortus siccus, whereas the author of the article THRELKELDIA in Rees's Cyclopædia (did Sir J. E. Smith continue his contributions so long?) says, "that this catalogue was founded on the papers of Dr. Thos. Molyneux, or the communications of other people," and seems to question the propriety of Mr. Brown's notice of him. Rank in science he neither claimed himself, nor have others done it for him; but so far is the preceding charge from being just, that Dr. Molyneux's contributions, having come too late to be incorporated with the work, were printed as an Appendix, and he appears to have expressly noticed every plant that was inserted in his catalogue on the authority of others. Threlkeld speaks of his work as a *pocket-book, a small treatise, an abridgement*, by which he hopes to stir up others to contribute their quota "to wipe off the ugly character Pomponius Mela has fixed on the Irish inhabitants, *cultores ejus inconditos esse, et omnium virtutum ignaros magis quam alias gentes.*" Yet he himself in the same preface gives a fair excuse for the neglect of this branch of learning, when he observes, "that the wars and commotions have laid an embargo upon the pens of the learned, or discord among the petty subaltern princes has rendered perambulation perilous, least they should be treated as spies," when he mentions his own danger at Tynemouth in 1707. In the days of Threlkeld botany was little more than a branch of medicine, and in this light he chiefly regarded it. To detail the virtues of plants was his grand object, and he satisfies himself with the names by which they could be found in the works of Gerard, Caspar Bauhin and Ray, who appear to have been his authorities, though he sometimes expresses himself peevishly of the changes made by the last, which in his eyes were not improvements. To their Latin name he adds the English one and the Irish one, when he could attain it. These "Irish names," he says, "I copied from a manuscript which has great authority with me, and seems to have been written sometime before the civil wars in 1641, and probably by that Reverend

Irish Divine Mr. Heaton, who is quoted by Dr. How in the Phytologia Britannica" for several plants, and also by Dr. Merret. He could find no living person acquainted with so many, and whether K'Eogh also made use of the same MS. or not, I have found their Irish names generally to agree. The number of species enumerated by Threlkeld (exclusive of all Cryptogamous plants, except the Fern tribe), was 473. Mackay's species in 1836 were 1054, and those of England 1436. When amongst those of Threlkeld we find *Arbutus Unedo, Dryas octopetala, Menziesia polifolia, Euphorbia Hiberna, Saxifraga umbrosa, Epipactis ensifolia, Osmunda regalis, Asplenium viride,* and other rare plants, some peculiar to Ireland, can we fairly say of such a country, that "its botany was as much unknown as that of an island in the Pacific"? May we not rather say that this collection made by Threlkeld, of plants observed by himself or by his predecessors, was a respectable foundation for future botanists to build upon? and that it should be estimated not by the knowledge of the present day, but by that of the period before the introduction of the Linnæan system? Amongst those whose discoveries were previous to Threlkeld's work, were Llhwyd and Sherard. Sherard's visit, as far as I can ascertain, was in 1695 or 1696, before he went abroad with Lord Howland afterwards Duke of Bedford; and he spent part of his time at Moira, not far from Lough Neagh, with Sir Arthur Rawdon. Amongst his discoveries were *Subularia aquatica, Epipactis grandiflora, Lithospermum maritimum, Drosera longifolia* (previously by Mr. Heaton), *Andromeda polifolia,* and probably others I have not noticed. The Murrogh of Wicklow is given by Mr. Mackay as one of the habitats of *Lithospermum maritimum,* where it grows plentifully; and this is the habitat given by Sherard. Now is it not interesting to know, that nearly a century and a half before Mr. Mackay's work this habitat was known? True, the designations of the plants are not such as to lead a Linnæan botanist to recognise them without some labour; and the alphabetical arrangement is bad, though perhaps not much worse than if the author had adopted Gerard's, C. Bauhin's, or even Ray's arrangement; and I cannot help regretting that Mr. Mackay did not consider it an object to study Threlkeld's work, and make it the foundation of his labours. The appendix was supplied by Dr. Thomas Molyneux, the brother of Locke's distinguished friend, and a man more known for his exertions to promote science in Ireland than for the honour of a baronetage, still enjoyed by his descendant. This Appendix contains a more bare list of the plants found than Threlkeld's own, and a few are thus given

a second time and even under a different name; yet still it is a valuable record, and deserving the attention of the Irish botanist. Another old work often referred to, is the *Botanologia Universalis Hibernica*, or a "General Irish Herbal," by Mr. K'Eogh, published in 1735. This gentleman was a clergyman, chaplain to Lord Kingston, and seems to have resided near Mitchelstown, the seat of that nobleman in the county Cork, to plants in whose garden he often refers. The garden of that nobleman's descendant, the present Earl of Kingston, is perhaps the finest in Ireland; and there is attached to it, for the use of the gardeners, a library of valuable botanical works, many of them very expensive, under the superintendence of the head gardener. Mr. K'Eogh also often refers to the Barony of Burren, in the county Clare, from which, I think it probable that he was a native of that county. His names are nearly the same as those of Threlkeld, his publication having taken place within eight years after. To notice the medical virtues of plants was his great aim, and this is done with respect to cultivated plants as well as wild ones; but he states when got in gardens and when found wild, so that the work is not without its use in ascertaining the native plants then known. His botanical knowledge, however, may not have been such as to justify the insertion of plants merely on his authority, though it might direct attention to look for them in the district pointed out. *Galega officinalis*, *Asclepias* or *Swallowwort* (species not mentioned), *Palma Christi* or the *Greater Spurge*, and others, are said to be wild in Burren. It is so unlikely that this should be so, that it throws a doubt on his authority; but if the district were well examined, it might be found that other plants were taken for them, which an indifferent botanist in the then rude state of the science might mistake for them, as I have little doubt that the *Ruta sylvestris, wild rue*, also said to be found there, was a *Thalictrum*, as he has not noticed any of that genus; and *T. majus* and *minus* are said to be found in an adjoining county, and generally known as *Meadow-rue**. This was suggested to me by a remark of Mr. Templeton's, who, having seen it stated that savin grew wild on the Mourne Mountains, and having diligently searched for it in vain, thought that *Lycopodium alpinum, Savin-leaved Club-moss*, which does grow there, and on other high mountains in Ireland, gave rise to the report. It is at once more candid and more probable to suppose that men mistake through

* My son, the Rev. W. Hincks, F.L.S., informs me that Cæsalpinus gave the names *Ruta sylvestris* and *Ruta sylvestris altera*, to *Thalictrum majus* and *minus*, which confirms my conjecture.

ignorance, than that they wantonly assert falsehoods. In judging of such works as those of Threlkeld and K'Eogh, we should consider them as abridgements of Gerard and his followers for medical purposes. No one now refers for descriptions to Parkinson, How, Merret, or even Ray, but these writers preserve to us the knowledge of their times, and for this purpose are referred to. In 1711 a Botanical Lectureship was established in Dublin College, to which a small physic garden was then or soon after annexed, in connexion with the medical school, but I have not traced any immediate benefit to the science derived from it. The Dublin Society, founded in 1731, by the attention it paid to agriculture and planting, both intimately connected with botany, indirectly contributed to its progress; but a society called the PHYSICO-HISTORICAL, about 1746, more directly contributed to our knowledge of the plants of Ireland by employing a botanist (name not recorded) to examine the county Down, the most important and interesting of the counties in Ulster, both on account of its varied surface and fertility, and its containing the Mourne Mountains. The list of plants collected by this person was submitted, I think, to Dr. Rutty of Dublin (esteemed a good naturalist for his time), and was published in the history of that county, attributed to Harris. The same Society sent Dr. Charles Smith to the south of Ireland, who published under their authority his histories of Waterford and Cork, and afterwards, the Society having terminated, that of Kerry, at his own risk. Mr. Mackay seems to have confounded these histories with the statistical accounts published under the auspices of the Dublin Society at a much later period; but he speaks of Dr. Smith's histories as possessing considerable accuracy with regard to the localities of plants, as he found during his botanical excursions through that part of the country. The next Irish publication on the subject was "Dr. Rutty's Natural History of the county of Dublin," in 1772, in which, though Mr. Lee had explained the Linnæan system in England in 1760, and Hudson had adopted it in the Flora Anglica in 1762, the old system was retained, which, considering the age of Dr. Rutty, and the length of time he had been collecting his materials amidst the avocations of a laborious profession, is not to be wondered at or censured. Whatever useful information it may contain, Rutty's work appeared to me less calculated to serve the purposes of an Irish Flora than that of Threlkeld. Previous to 1780, we had then lists of plants by Threlkeld, K'Eogh, and Rutty; of the rare plants of Down, by an unknown person, but under the direction of a

Society in Dublin; of the rare plants of Waterford, Cork, and Kerry, the three most southern counties, by Dr. Charles Smith, whose accuracy is admitted, and communications to the lists of How, Merret, and Ray, of the most remarkable plants that had yet been found in the country. We have now to inquire what progress was made in Ireland after 1780, and previous to Mr. Mackay's labours. In 1785, the Lectureship on Botany in the University was changed by Act of Parliament to a professorship, and annual courses of lectures were made imperative. Dr. Edward Hill, who had been lecturer, was the first professor, and continued to fill the chair till his death in 1801. I have not heard any character of his lectures, but it is reasonable to suppose that the increasing love of botany, which led to the change in the College, and to other circumstances, must have originated with him. Be this as it may, we find Dr. Robert Scott, who was afterwards his successor, Dr. Wade, Dr. Young, a fellow of Dublin College (afterwards bishop of Clonfert), an eminent promoter of science, Dr. Whitley Stokes, Fellow of Dublin College, and now Professor of Natural History in it, Mr. Blashford, a barrister, and others, adding every now and then new contributions to the Flora. At this time the late Mr. Templeton turned his attention to botany, and in 1793 had actually laid out that garden, known to all the botanists who have visited Belfast; that garden in which he made the interesting experiments on raising plants in the open air, previously found only in conservatories, communicated to the Royal Irish Academy in 1799; that garden which to this day is a monument of his zeal, his skill, and of that attachment to botany with which he inspired his family. In 1792, Dr. Brinkley came to Ireland as Professor of Astronomy, and he was an ardent botanist; Dr. Barker made out a list of the plants of his native county, Waterford, Mr. Tighe of those of Kilkenny; and the illustrious Robert Brown, being at Derry for some time previous to his going to New Holland, not only carefully examined that county, but extended his researches to the county of Donegal. All the gentlemen whose names I have mentioned were in communication with Mr. Templeton, and he was urged by most of them to undertake the Flora of Ireland, with a promise of assistance. In the meantime Dr. Wade published his Flora of the county Dublin in 1794. About the year 1800 the Dublin Society established a professorship of botany, which was filled by Dr. Wade, and began the Glasnevin garden, having Mr. Underwood for their first gardener. The parliamentary grant for this purpose was procured chiefly by the

exertions of the Right Hon. J. Foster, Speaker of the House of Commons, who had long been a zealous promoter of botany, and was considered to be well acquainted with it as a science. In 1801 Dr. Scott was elected professor in the College, and the board which has the direction of the College funds determined on having a suitable garden of their own, and engaged Mr. Mackay as curator, who came to Ireland about 1803 or 1804. In 1807 the proprietors of the Cork institution determined on having a garden, and engaged Mr. James Drummond as their curator. Previously to this, Mr. Templeton had a list of 815 species of phænogamous plants with their habitats, whilst his list of mosses, lichens, fuci, and fungi, was even more extensive in proportion. Thus early too, Miss Hutchins also had devoted herself to botanical pursuits, and had carefully examined the neighbourhood of Bantry Bay for phænogamous plants, though her chief discoveries were in the Algæ. The county surveys were at this time publishing under the auspices of the Dublin Society, in some of which lists of rare plants were given. It has been objected that the natural history part of these surveys is of little use, but it should be remembered that agriculture and statistics were the chief object, and we may surely ask whether the county surveys of England and Scotland displayed a more accurate knowledge of natural history? I date 1804 as the period from which Mr. Mackay's labours commenced, and I think I have a right to conclude, not only that the botany of Ireland was tolerably well known before he came, but also that if a considerable desire of promoting the science had not been previously formed, the parliament, the Dublin Society, and the heads of the university would not have incurred such a heavy expense as to establish two gardens, maintain two professors, and employ two able curators. It was not these gentlemen who first formed the taste, but their engagement was the result of its having been already formed. The Dublin Society not only had their garden, but they employed an under gardener in going through the country, and enabled their professor to travel in the west, publishing the result of his tour. In like manner the College employed Mr. Mackay in visiting the south and west, and the Cork institution sent Mr. Drummond into the west of their county and the county of Kerry. Mr. Mackay's catalogue of rare plants, printed in 1806, and Mr. Drummond's list of the plants of the county Cork, printed in 1810, both at the expense of the Dublin Society, show the result of these missions. It is no reflection on these gentlemen to observe, that having been employed for the purpose, they were able to do more than

those who could scarcely be expected to take long journeys at their own expense, merely for the sake of science. The same may be said of later discoveries, made under the Ordnance department. What has been done by such men as Messrs Mackay, Drummond, and Moore, (and no one can more cheerfully acknowledge that they have done much) is to their honour, but should never be brought forward to the disparagement of those who were mere voluntary labourers. I now leave it to the judgement of the reader, whether it was fair to attribute almost all to Mr. Mackay and his contemporaries, or to use language which might appear to a stranger to imply, that even in 1833 the botany of Ireland had remained amongst its enlightened inhabitants *almost a sealed book.*

[To be continued.]

II.—*On* Sphæronites *and some other genera from which* Crinoidea *originate. By* L. Von Buch*.

Perhaps there are few schemes of general structure sketched by Nature within whose circle so many and so variously modified forms have been unfolded as the beautiful Lilies of the Ocean, the *Encrinites* or *Crinoidea.* From their simple origin they diffuse themselves in every direction to the most wonderfully complex and numerous forms, and then suddenly return in the progress of creation to a proportionately small number; so much so, that of the numerous genera and species of the primitive age, only the solitary *Pentacrinus* has come down to our present period. But other forms have unfolded and diffused themselves in all oceans. The corolla of the lily has again closed, and perfectly enveloped *Asteriæ* and *Echini,* capable of greater movement and development, have taken the place of the *Crinoidea.*

No formation can produce a greater number of the most varied forms of these creatures of the primitive age, than the transition formation from the oldest strata to the carbonaceous series. Their chief character in this period is, that the parts which envelope the body have still greatly the superiority over the auxiliary members which are to convey the nutriment, the far-spread many-fingered arms. This body becomes smaller and smaller, and consists of fewer pieces in the Jura formation; the arms and fingers are on the contrary longer, more compound, and in greater number. With *Comatula* or the *Euryalæ,* the body separates entirely

* Read before the Royal Academy of Sciences of Berlin, March 16, 1840, and translated from the Berichte der Akademie.

from the petiole, and in *Echinus* and the allied genera there is no longer need of any corolla.

But before the ocean-lily had opened and expanded its arms, it moved on a short pedicel in the closed state in innumerable quantity, and only by frequent and highly varied attempts did this rupture and expansion succeed. These closed *Crinoidea* are still but little and imperfectly known; they deserve to be known, however, in every respect. For hitherto no *Encrinus* has been found in the lower beds, and from them there is formed an uninterrupted transition to the *Pentacrinus* of the existing ocean. Hitherto these forms have occurred almost exclusively in northern countries; in Sweden, in Norway, and in the hills which bound St. Petersburgh on the south; and among them the *Sphæronites* are most frequently met with.

These are large round spheres, like oranges, with two poles at the extremities. Linnæus, in his journey through Oeland, called them crystal-apples. Gyllenhahl, in an able investigation and description (1772), was however the first to recognize their organic nature, and concluded that they might be placed near to *Echinus*, on which account Wahlenberg applied to them the name *Echinosphærites*, which Hisinger has exchanged for the better one of *Sphæronites*. These spheres are formed of numerous polyhedrous plates, generally hexagonal, perhaps of two hundred in one specimen. Above opens a mouth, which is covered by a number of very small moveable shields. Below, a petiole of thin pentagonal articulations fixes the body to the soil. The plates are all perforated. In *Sphæronites Aurantium* these small pores stand in a row from each angle of the polyhedron towards the centre, yet not quite up to the centre itself. Each of these pores is connected by a deep furrow with the adjacent plate, thus giving rise to *rhombs*, which always extend over two plates or *assulæ*; sometimes so prominently, that the rhombs themselves have been taken for *assulæ*, and a species erroneously named *Sphæronites Granatum*, because a similarity was found in these rhombs to the surfaces of a granite crystal. But Gyllenhahl had long before shown that the true polyhedrous assulæ bisect the rhombs in the shorter diagonal, and at right angles with their striping. Pander, however, proves what had escaped Gyllenhahl, that these stripes or grooves connect tentacular apertures, as two pores do in the ambulacra of the species of *Cidaris*. And therefore it is very probable that *Ischadites Koenigii* (Murch. Silur. Syst. Pl. 26. fig. 11.) is only *Sphæronites Aurantium*, upon which an outline has been given to the rhombs not belonging to them, and distorting the whole. This discovery of Pander of tentacular passages,

and consequently of tentacula, is important. They reappear on many *Encrinites*; for instance, on *Actocrinites*, on *Rhodocrinites*, and even on *Marsupites*. (Bronn, Lethæa, Pl. IV.) The rhombs are not evident on the surface of *Sphæronites Pomum*. Each plate bears a number of small systems, separated *inter se*. Two pores are always connected with one another, but these systems are scattered without arrangement over the entire surface. This species has hitherto only been found in Sweden.

In the upper half of the *Sphæronites*, but still a fourth of the sphere distant from the mouth, there is a large pentagonal aperture, which is closed by five triangular valves projecting in a flattened pyramid. Gyllenhahl and his successors call this aperture the mouth. But analogy with the allied forms requires the mouth to be above, and an aperture closing *exteriorly* appears little adapted for a nutriment-receiving mouth. Probably it is an oviduct. Above, quite close to the mouth, and *constantly to the right* of the valvated aperture, there is a third very small opening, penetrating deep into the interior, probably an anus. A similar small anal aperture is likewise evident between three laminæ on *Apiocrinites*, where hitherto it has not been observed, resembling the anus of the living *Comatula*. Gyllenhahl expressly states, "I always found this *Sphæronites Pomum* in Westgothland, at a greater depth than *Sphæronites Aurantium*, and in far greater number." It is therefore surprising that it has not yet been met with in the neighbourhood of St. Petersburgh.

Hemicosmites pyriformis.—By means of this beautiful and extremely elegant form, we approach a great step nearer to the true *Crinoidea*. Although still without arms and closed, there are already here but few plates or *assulæ*, in definite number and regularly combined. The *Hemicosmites* is reverse pear-shaped, and consists of three parts, of *pelvis*, *thorax*, and *vertex*. The pelvis on the slender pentagonal petiole is formed of *four pieces*, which are arranged in a hexagon. Two of them are pentagons, the two others lozenges (rhombs). Six *costals* in two different groups form the thorax. Three of these plates are narrower, and above, between those on the left, there is a *pentagonal aperture closed with valves* as in *Sphæronites*. The three other assulæ are broader, and the superior apex of the elongated hexagon is somewhat truncated. In accordance with this, the vertical plates arching over the whole also divide into two groups; on the side of the broader assulæ there is on each truncation of their apex a longitudinal piece, as it were, inserted, and there are therefore three such pieces; they are wanting on the side of the valvate aperture. The exceedingly small laminæ which cover the mouth on the top

of the vertex, appear to terminate in three small processes or arms which are pierced, and might perhaps form distinct oval apertures. No anal aperture is evident. The great regularity of this arrangement is still more evident from the great elegance with which prominences are distributed in series over each assula of thorax and vertex. They proceed on the costals from the centre to the *upper* angle of the hexagon, none towards the lower. On the vertical assulæ, on the contrary, these series go towards the *lower* angles, none towards the upper. Only the halves of the surfaces are decorated in this remarkable manner. The vertical and lateral series thus combine to form a highly elegant wreath environing the whole figure. These warts or prominences are pierced in the centre, and appear to be points of adhesion for spines. The central series of each assula is double. On the other parts of the assular surface there are but few similar warts scattered without any order.

Cryptocrinites regularis and *C. Cerasus* (Pander, t. ii. f. 24. *n.* 26.).

The pelvis is that of a *Platycrinites*, the thorax that of a *Poteriocrinites*; but the vertex is still closed, and without arms. However, five ribs or rings extending from the lower extremity to the vertex are hidden beneath the assulæ, which are thus raised exactly in the form of a roof, just as may be observed in *Actocrinites* before the arms divide. The essential character of the *Crinoidea* exists, therefore, almost entirely in the *Cryptocrinites*, but it is yet hidden in the interior. The pelvis consists of *three plates*, which are united to form a pentagon, an arrangement which again occurs in *Platycrinites*, in *Rhodocrinites*, and in *Actocrinites*, but only in the older ones; in the later Jura *Crinoidea* it is no longer found. The thorax is surrounded by *five costals*, and the vertex likewise by *five* plates, which alternate with the costals. Minute plates surround the mouth, which is for the most part open. Between the vertex and costals there is again a large *aperture covered by five valves*. In *Cryptocrinites Cerasus*, intercostals are, moreover, situated on the original five of the thorax, thus somewhat disturbing the regularity of the upper half; and there are also probably more than five assulæ or plates on the vertex. The side on which the valvate aperture is situated is bulged out at all points; the effort of the hidden arms to break through the sides is here evident. The size of these animals seldom exceeds that of a pea; the petiole which bears it has the thickness of a pin. Hitherto they have occurred solely in the hills near St. Petersburgh.

III.—*Catalogue of the Land and Freshwater* Mollusca *of Ireland.* By Wm. Thompson, Vice-President of the Natural History Society of Belfast.

On the subject of the Conchology of Ireland, three catalogues were published within a comparatively short period; Dr. Turton's in July 1816, in the 'Dublin Examiner, or Monthly Miscellany of Science, Literature and Art;' Capt. Brown's in the second volume of the Wernerian Memoirs in 1818*; and in this same year a third appeared in the Appendix to Walsh and Whitelaw's History of Dublin, from the pen of M. J. O'Kelly, Esq. of that city. The species of land and freshwater Mollusca enumerated in these three catalogues are much the same, and about fifty in number. In the subsequent works of Brown and Turton a few more species were added. To Bryce's 'Tables of Simple Minerals, Rocks and Shells,' found in three of the northern counties, published in 1831, Mr. Hyndman contributed two species hitherto unnoticed. In the London and Edinburgh Philosophical Magazine for 1834 (p. 300.), about thirty additional species were made known by myself; in a paper entitled 'Additions to the Fauna of Ireland,' published in the Annals for last March, I noticed a few more; and in the present communication there are two species previously unrecorded. I shall here, for the sake of brevity, avoid entering into detail respecting any of the species thus alluded to, but shall correct in its proper place in the following paper, in so far as my information extends, every error, either of others or of my own.

The order in which the genera and species appear in Mr. Gray's edition of Turton's 'Manual of the Land and Freshwater Shells of the British Islands,' is adopted.

Class 1. GASTEROPODA, *Cuv.*

Order I. Phytophaga.

Fam. 1. Neritidæ.

Gen. 1. Neritina, Lam.

1. *N. fluviatilis*, Lam. Gray, Man. p. 83. pl. 10. f. 124.

Nerita fluviatilis, *Mont.* p. 470; *Drap.* p. 31. pl. 1. f. 1—4.

Is found in the east, west, and south of Ireland. The localities given by Capt. Brown are—"In a stream at Clonooney; in the Shannon and Bresna; and in some places of the canal adhering to stones," p. 532. In the vicinity of Dublin it occurs in the Grand

* This catalogue was dated from Naas Barracks, Ireland, 20th August, 1815, and read before the Wernerian Society of Edinburgh on the 16th of December in that year.

Canal; at Lough Derg and Limerick it is found in the Shannon; and in the county of Tipperary in some of the tributaries of this river; and about Cork in the river Lee. The specimens which I possess from the Shannon and Grand Canal are identical with the *N. fluviatilis* represented by Rossmassler, and as distinguished from the *N. Danubialis*, *N. strangulata** and *N. transversalis*. Icon. part. 2. p. 17, 18. pl. 7.

Fam. 2. Paludinidæ.

Paludina, Lam.

1. *P. vivipara*, Lam. Gray, Man. p. 90. pl. 10. f. 118.
   Cyclostoma viviparum, *Drap.* p. 34. pl. 1. f. 16, 17.
   Helix vivipara, *Mont.* p. 386.

In his 'Irish Testacea,' p. 527, Capt. Brown notices this species under the last-quoted name as found "in a stream near Newtownards, county of Down, rare"—by a letter from this author I learn that he himself procured the shell in that locality. Mr. Gray (Man. p. 34.) incidentally notices *Paludina achatina* as an Irish species, but on inquiry from him he could not recollect from whom he had received the information. I have not seen undoubtedly native specimens either of *P. vivipara* or *P. achatina*.

2. *P. tentaculata*, Flem.
   Helix tentaculata, *Linn.*, *Mont.* p. 389.
   Bithinia tentaculata, *Gray*, Man. p. 93. pl. 10. f. 120.
   P. impura, *Lam.*, Turt. Man. p. 134. f. 120.
   Cyclostoma impurum, *Drap.* p. 36. pl. 1. f. 19, 20.

A common species throughout the island, generally approximating Draparnaud's var. f. 20. pl. 1. more nearly than his normal shell f. 19. I have on different occasions found the stomachs of Gillaroo Trout from Lough Neagh filled with this Paludina.

Fam. 3. Valvatadæ.

Valvata, Muller.

1. *V. piscinalis*, Lam. Gray, Man. p. 97. pl. 10. f. 114.
   Cyclostoma obtusum, *Drap.* p. 33. pl. 1. f. 14.
   Turbo fontinalis, *Mont.* p. 348. t. 22. f. 4.

Common, and generally distributed over Ireland. Many of my middle-sized specimens correspond with Pfeiffer's *V. depressa*, in so far as the figure and diagnostic description enable me to judge, Pfeiff. part 1. p. 100. t. 4. f. 33. See Gray, Man. p. 98. This species is very variable in the degree of elevation of its spire, and consequently in its diameter relatively to its height. I have been favoured by Edward Waller, Esq. with specimens of this *Valvata* collected at Finnoe, county Tipperary, the volutions of which appear angular from being spirally cut, as they occasionally are in various species of *Limneus*, and the angles are marked with a white line.

* Specimens from Carniola, named "*N. strangulata*, Menke," by M. Michaud, who favoured me with them, when compared with my *N. fluviatilis*, fully bear this out.

2. *V. cristata*, Mull., Gray, Man. p. 98. pl. 10. f. 115.
Helix cristata, *Mont.* p. 460. vign. 1. f. 7, 8.
Valvata spirorbis, *Drap.* p. 41. pl. 1. f. 32, 33.

This handsomely formed species is distributed over the island. The *Valv. Planorbis*, Drap., noticed as Irish in Lond. and Edin. Phil. Mag. 1834, p. 300, must be erased from the list.

Order II. Pneumonobranchiata.

Fam. 1. Arionidæ.

Arion, Ferus.

1. *A. ater*, Gray, Man. p. 104.
Limax ater, *Linn.*
Arion empiricorum, *Fer.*

This species, the common "black snail," is abundant throughout Ireland. Its varieties, *A. rufus* (*Limax rufus*, Linn.), and *A. marginatus*, as remarked by Mr. Templeton, likewise occur. Under a coloured drawing of the latter made by this naturalist is the remark, "common in fields about Cremorne, county Monaghan, August 4, 1805." The yellow variety is likewise found in the north and south (Miss M. Ball). Under precisely the same circumstances of food and "habitation" I have met with the varieties above-mentioned. See Gray, Man. p. 105.

2. *A. hortensis*, Fer. Gray, Man. p. 107.

"Common at Cranmore (Belfast)." Templeton's MS. Coloured drawings of the variety of this or the preceding species, named *A. circumscriptus* by Dr. Johnston, were made by Mr. Templeton in 1808. To this I can only add, that the species is common throughout the north.

Fam. 2. Helicidæ.

1. Limax, Fer.

1. *L. maximus*, Linn. Gray, Man. p. 112.
L. cinereus, *Drap.*

This, the common "large grey slug," is equally abundant in north and south. In the stomach of the Song Thrush (*Turdus musicus*), I have frequently found the shell of this species, the *Limacella parma* of Turton's Manual, after the animal, of which it had been part, had been entirely dissolved. I have procured similarly the shells of the smaller *Limaces* from the Blackbird (*Turdus Merula*). Either this or the next species is accused by Miss M. Ball of making its way into pantries and eating holes in bread.

2. *L. flavus*, Linn. Gray, Man. p. 114.
L. variegatus, *Fer. Hist. de Moll.* p. 71. pl. 5. f. 1—6.

In Mr. R. Ball's collection are a number of these, which were brought by him from Youghal. In the north it has occurred to myself.

3. *L. agrestis*, Linn. Gray, Man. p. 117.

This, the small rough yellowish species, is very common throughout the north, and I believe in Ireland generally.

4. *Limax*

The Rev. B. J. Clarke, of Merrion Square, Dublin, has favoured me with a coloured drawing and a description of a *Limax* which he has taken at La Bergerie, Queen's county, and describes to be "blackish-grey on the back, lighter underneath, with a sharp keel down the back proceeding from the shield." It may be the *L. carinatus*, Leach, or *L. gagates*, Drap.; but not having seen any specimens, I abstain from naming it even with a mark of doubt.

2. Vitrina.

V. pellucida, Drap. p. 119. pl. 8. f. 36, 37. Gray, Man. p. 120. pl. 3. f. 21.

Is in suitable localities distributed over Ireland, and may be found under the first stones we meet with in going inland from the seashore, up to as great an altitude in the mountain glens as there are moss and leaves to shelter it. I have remarked the colour both of animal and shell to vary, and the latter to present some differences in form. See Jeffreys on *V. Mulleri* and *V. Draparnaldi* in Linnean Transactions, vol. xvi. When thin and of an almost crystalline transparency, the shell is often more handsomely formed than when thicker and of a greenish colour, and is intermediate between the *V. pellucida* and *V. diaphana*, as represented by Draparnaud (pl. 8.) and Rossmassler (t. 1.); this state is equally common with the normal *V. pellucida*; of this, the animal is lighter in colour, and not so large compared with the shell as in the variety*.

3. Testacella. Cuv.

Testacellus haliotideus, Fer. Gray, Man. p. 124. pl. 3. f. 19, 20.

Testacella haliotidea, *Drap.* p. 121. pl. 8. f. 44, 45.

This species was discovered many years ago by Mr. R. Ball in the town gardens at Youghal, where it has become much scarcer of late. The Irish specimens agree with English examples of the var. *T. scutulum*, with which I have been favoured by Mr. G. B. Sowerby. Mr. Gray (Man. p. 123, 124.) seems to consider this a naturalized species, but the circumstance of its being found at Youghal speaks more strongly in favour of the *T. haliotideus* being a true native than that of its being met with in some of the gardens around

* Most of the very numerous species of land mollusca which I find on the fallen leaves of trees are particularly partial to those of the Scotch elm (*Ulmus montana*); when the large and rough leaves of this tree are mingled with those of the common forest or ornamental kinds, I have observed that about twenty specimens may be found on them, for one on an equal proportion of any of the others. When the ground is saturated with moisture the cause of this preference is obvious, as the nerves of the leaves are so strongly developed, that when the under side is next the ground the membranous portion of the leaf between them remains quite dry.

London, to which it might much more readily have been introduced along with exotic plants. In a garden at Bandon, too, a *Testacellus* has been procured by Mr. G. J. Allman. The circumstance of this species, indigenous to France and to the island of Guernsey, being found only in the south of England and Ireland, seems to me strongly in favour of its being equally indigenous to these countries. Mr. Ball, in reply to some questions, observes, "I first became aware of this *Testacellus* preying on worms by putting some of them in spirits, when they disgorged more of these animals than I thought they could possibly have contained; each worm was cut (but not divided) at regular intervals. I afterwards caught them in the act of swallowing worms four and five times their own length. Some of these *Testacelli*, which I brought to Dublin and put in my fern house, produced young there."

Testacellus Maugei is noticed by Dr. Turton (Manual, p. 28.) as found "in Ireland," but I have been unable to give any information respecting it, and these two words seem to me insufficient to establish it either as an introduced species or otherwise.

4. Helix.

1. *Helix aspersa*, Müll. Gray, Man. p. 128. pl. 4. f. 35; Drap. p. 89. pl. 5. f. 22.; Mont. p. 407.

Although distributed over the four quarters of the island, this Helix is less generally met with than several other common species. In a well-cultivated and moderately wooded district near Belfast, stretching along the base of the mountains where chalk chiefly prevails, presenting different soils, especially clay and alluvium, and rising to an elevation of 500 feet above the sea, it is never found. Mr. Edward Waller, who has successfully investigated the Mollusca about Annahoe, county Tyrone, states that the *H. aspersa* is unknown there. It seems partial to the vicinity of the sea; so much so, that about Ballantrae in Ayr-shire, Scotland, I have remarked numbers of them on rocks, subjected to the spray of the waves, which had bleached the portion of the shell thus exposed as white as it usually becomes in the progress of decay, although the animal inhabitants were all in the highest vigour. In the crannies of the ruined castles, which, like Dunluce, are based upon the summits of some of the highest cliffs washed by the sea in the north of Ireland, the *H. aspersa* is abundant.

In one instance which may be mentioned, differences of rocks, soil, or shelter will not explain the absence of this species from particular localities. During a forenoon's walk on the marine sand-hills of Portrush and Macgilligan (county of Londonderry), which are only a few miles apart, and present in every respect precisely the same appearance, I found the *H. aspersa* abundant at the former, but at the latter wanting, and here the sand-hills are much more extensive than at Portrush. At the nearest sand-hills, again, on the coast to the east of the latter, and only a few miles distant, I did not during a short visit find the *H. aspersa*; and here *Helix virgata*, which is not found at the other two localities, appeared, and

took the place of *H. ericetorum*, which is common to them; here, too, and at Portrush, *Bulimus acutus* was present, though not so at Macgilligan. On the 8th of June I once observed the *H. aspersa* in coitu, and with the spicula adhering (see Montagu in Test. Brit.);—these are half an inch in length, hollow, and broaden conderably to the base.

In the Magazine of Natural History, vol. v. p. 490, Mr. Denson states that in severe winters the *H. aspersa* is in the old botanic garden at Bury St. Edmunds eaten in quantity by the Norway rat; a fact of which I some years ago had circumstantial evidence in the broken shells lying about the entrance to this animal's abode among heaps of stones in the Horticultural Society's garden at Chiswick, London*.

2. *Helix hortensis*, Lister. Gray, Man. p. 130. pl. 3. f. 24; Drap. p. 95. pl. 6. f. 6; Mont. p. 412.

Although apparently not numerous anywhere, it would seem to be widely distributed in Ireland. To myself it has occurred about Dublin, and at Portrush, along with *H. nemoralis* and *H. hybrida*; has been obtained in the county Donegal: at Moira and Newcastle, county Down; King's County; Kildare; Tipperary; and about the city of Cork. As some authors make the white lip and less size the only differences between this species and *H. nemoralis*, I was for some time in doubt whether it might not be a small variety of the latter, but was fully satisfied of its distinctness by finding both species plentifully in company at Dovedale (Derbyshire), when every individual in size, &c. maintained the respective characters of its species. The *H. hortensis* seems partial to limestone districts.

3. *Helix hybrida*, Poiret. Gray, Man. p. 132.

In July 1833 I obtained the handsome *Helix*, so designated by Mr. Gray, on the marine sand-hills at Portrush, near the Giant's Causeway, along with different varieties of *H. nemoralis* and a very

* *Helix Pomatia*, Linn. The following observations of W. H. Harvey, Esq., communicated in a letter to me in January 1831, include all that need be said of this shell. "Dr. Turton, in his Conchological Dictionary, states that this species is mentioned by Dr. Rutty in his 'Natural History of the county of Dublin,' as not uncommon in his time. On referring to Dr. Rutty's work I cannot find any such assertion. At p. 379. vol. i. he certainly admits it in the following terms: 'Cochlea duplex primo terrestris, the terrestrial snail, and particularly the house snail, which is thus distinguished by Listor; Cochlea cinerea maxima edulis, cujus os operculo crasso gypseo per hyemem clauditur:' and then goes on to tell of its uses as food, the manner of cooking it, &c., but not one word about its habitat."

The *H. Pomatia* has of late years been introduced from England to different localities in Ireland, as Dalkey island, off the Dublin coast, Youghal, &c. In the autumn of 1834 I turned out a few individuals of this species and of *Cyclostoma elegans* on the chalk in the neighbourhood of Belfast, but they have not increased; after a few months I could not find one of either species about the place. See Gray, Man. p. 35.

few individuals of *H. hortensis*. When shown to Mr. Gray in the following spring he considered the specimens to be *H. hybrida*. Judging from the shell alone, I should not be disposed to consider this *Helix* more than a variety of *H. nemoralis*.

4. *Helix nemoralis*, Linn. Gray, Man. p. 132. pl. 3. f. 23; Drap. p. 94. pl. 6. f. 3—5; Mont. p. 411.

This *Helix*, presenting its endless and beautiful varieties in colour and the number and breadth of bands, is more commonly distributed over Ireland than any other species. When on the extensive rabbit warren or marine sand-hills at Portrush on the 10th of July 1833, I remarked it, together with *H. aspersa*, *H. erictorum*, and *H. Balimus acutus*, to be not only abundant, but huddled together in heaps: the animals were alive in all, and of the *H. nemoralis* several had the apertures closed up. Among the individuals of this species some were of the white-lipped variety, which has not uncommonly been mistaken for *H. hortensis*; others had the lip of a rose colour, margined with white (*H. hybrida*): the specimens, which were so numerous, that every variety of shade in the lip, from white to the darkest brown, could be traced, seem to prove that the colour of the lip no more than that of the shell is of any specific value. The absence of the Thrush genus (not an individual belonging to it could be seen on this occasion), of which some species feed very much on these mollusca, may be one cause of their being permitted to increase and multiply to such an extent. Considerably the largest specimens of *H. nemoralis* that I have collected were obtained in the South Islands of Arran off the coast of Clare. This species is generally noticed as inhabiting "woods and hedges," but to myself it has never occurred so abundantly in the vicinity of either wood or hedge (about which its enemies "most do congregate"), as entirely remote from them; or among the debris of limestone or chalk cliffs and quarries, and on marine sand-hills.

The Rev. R. Sheppard has observed in Suffolk that the plain coloured, the single-banded, and the many-banded, do not mingle with each other in coitu, but that each is true to its banded or bandless mate. (Linn. Trans. vol. xiv. p. 163.) In Ireland those so differing have no such scruples; such as I have seen in connexion and displaying each other's spicula or love-darts, have been very dissimilar in colour and markings; they have so occurred to me from the middle of April to that of September. Mr. Hyndman once found a spiculum of this species stuck through the leaf of a dandelion (*Leontodon Taraxacum*); if there be but the one use in this missile, it would thus seem that the animal will occasionally miss its aim.

A *H. nemoralis* of ordinary size which I found near Belfast, exhibits a prominent tooth where the basal margin joins the whorl. I have in the month of May detected the blackbird preying on this Helix.

5. *Helix arbustorum*, Linn. Gray, Man. p. 137. pl. 3. f. 25; Drap. p. 88. pl. 5. f. 18; Mont. p. 413.

This delicate and handsome species was noticed by Capt. Brown and Dr. Turton as having been found about Dublin; at Killarney the Rev. Thomas Hincks of Cork informs me that it is met with; but the north seems to be its more favourite abode: in suitable localities throughout the county of Antrim it prevails, as it likewise does in Down, but more sparingly. Of 147 specimens collected at the same time in the neighbourhood of Larne in the former county, all were of the ordinary state, or marked with the dark band (see Pfeiffer, tab. 2. f. 7.), except 12, which were of the variety in which the band is wanting, the spotting much paler, and the colour generally much lighter. (Pfeiff. tab. 2. f. 8.) Having collected this species in England and Scotland as well as Ireland, I may observe that a certain degree of moisture and shelter have always seemed to be its desiderata. At Dovedale in Derbyshire, and at Knockdolian in Ayrshire*, it occurred plentifully about moist limestone cliffs, and in the latter locality with little more than ferns (especially *Cystea fragilis*) to shelter it. In the north of Ireland I have met with it in shady woods in the lower grounds, and likewise in young plantations at a considerable elevation in the mountains, and where there was no more shade or moisture than the *Luzula sylvatica* requires. From its shell being so easily broken this animal is a favourite food of the thrush genus. (See Magazine of Zoology and Botany†, vol. ii. p. 436.)

6. *Helix pulchella*, Mull. Gray, Man. p. 141. pl. 5. f. 49; Drap. p. 112. pl. 7. f. 30—34.

H. paludosa, *Mont.* p. 440. H. crenella, *Mont.* p. 441. pl. 13. f. 3.

This species may more literally than most others be stated to be distributed over Ireland, for it is the verge of the sea that marks its boundary. Although occurring throughout the inland parts of the country, it seems especially to delight in the short pastures in the vicinity of the sea around the entire coast; in some of the islets of Strangford Lough, too, I have in like manner observed it.

The var. *H. crenella*, Mont. has been considered by some naturalists peculiar to damp situations; but with this my observation does not accord, the beautiful ribbed variety being more frequent than the smooth state on the dry sea-banks of the North of Ireland. Mr. E. Waller writes to me, with reference to Finnoe, county

* At the Falls of Clyde Mr. Hyndman has collected specimens.

† *Helix lapicida*, Linn. Gray, Man. p. 140. pl. 5. f. 51. Capt. Brown inadvertently noticed this species as found in the neighbourhood of Belfast by Dr. M'Donnell, p. 523, by whom I am informed that the specimens seen by that gentleman in his collection were English. In his Catalogue of Irish Shells, Dr. Turton says of this species, "found by Mrs. Travers of Belgrove, on the stone steps of her mansion at Cove;"—rather a suspicious habitat. The species has not occurred in Ireland either to myself or to any correspondent; English specimens have in a living state been turned out in the neighbourhood of Limerick within the last year.

Tipperary, "I have found both varieties of *H. pulchella* in high and and dry grounds as well as damp and low*."

7. *Helix fusca*, Mont. p. 424. t. 13. f. 1; Gray, Man. p. 147†. pl. 4. f. 36.

This handsome species was noticed by Turton as Irish, but merely in the words "woods in Dublin." (Conch. Dict. p. 61.) It is found in the north, east, west, and south, but in King's County and Tipperary has not been met with by my correspondents. As this species, though widely distributed, is by no means common, the following habitats may be enumerated. Glens in the Belfast mountains and Drumnasole, county Antrim; Florence Court, county Fermanagh, W. T. Altadawan, county Tyrone, Edward Waller, Esq.; Kilruddery demesne, county Wicklow, T. W. Warren, Esq.; Monivea, county Galway, Rev. Benj. J. Clarke; "near Limerick once," W. H. Harvey, Esq‡.; Youngrove near Youghal, Miss Ball; Dunscombe Wood near Cork, Miss Hincks: in this locality the Rev. T. Hincks, who has supplied me with very fine specimens, remarks that it is abundant. The following notes are perhaps not irrelevantly introduced. Dec. 16, 1833.—Although several times before in Colin Glen near Belfast, in search of Mollusca, I today for the first time, in consequence of its somewhat peculiar haunts, obtained specimens of the *H. fusca*, and of them about two dozen. The ground was saturated with moisture, and they were all briskly traversing the rich green leaves of the *Luzula sylvatica*, and one or two other plants of similar foliage. The animal is much elongated, and moves about with considerably greater rapidity than any Helix I have seen; its colour is uniform, but in different individuals varying from "wine-yellow" to blackish-grey§; tentacula of the latter colour, the longer pair in the adult animal 2½ lines in length; from their base a black line extends along the back for 3 lines. Dec. 10, 1837.—In Colin Glen today I obtained upwards of thirty of these *Helices*. The ground was wet, but there had been no rain in the preceding night, and consequently they were not found (with a very few exceptions) on the *Luzula*, but were instead lying sheltered and quiescent be-

* *Helix Cantiana*, Mont. p. 422. pl. 13. f. 1; Gray, Man. p. 141. pl. 3. f. 26.

Is in Turton's catalogue of Irish Shells stated to have been found in "hedges and box borders about Dublin," and in his Conchological Dictionary "Cork" is noticed as a habitat. I have not seen Irish specimens of this *Helix*, nor is it known to any naturalist with whom I have communicated to have been ever found about Cork, Dublin, or elsewhere in Ireland. From the two localities just named I have seen specimens of *H. virgata* without bands, and coloured similarly to *H. Cantiana*, and being much depressed, closely approaching it in form; they might thus possibly at a cursory view be passed over as immature individuals of this species.

† The two wood-cuts in this page are very characteristic.

‡ From Mr. Harvey I have specimens which he collected at the Falls of Clyde, Lanarkshire; near Ballantrae, Ayrshire, it has occurred to myself.

§ On extracting the animals the shells were found to be all of the same amber hue.

neath masses of the fallen leaves of forest trees contiguous to that plant. About three o'clock, when it began to grow dusky, they commenced stirring about on the green leaves of their favourite *Luzula sylvatica*, where in less than half an hour I procured a dozen of them. I have since occasionally seen this species on the stems of trees at a considerable height from the ground and in very dry weather.

8. *Helix fulva*, Mull. Gray, Man. p. 148. pl. 5. f. 47; Drap. p. 81. pl. 7. f. 12, 13.

H. trochiformis, *Mont.* p. 427. t. 11. f. 9.

Although not common, is generally distributed over the island, and found in woods among fallen leaves and timber; and under stones, &c. in various situations from the sea-side to the mountain. It seems rarely to occur in quantity, but once at Wolfhill near Belfast, I found thirty individuals congregated under one small stone.

The *H. Mortoni*, agreeing both in animal and shell with Mr. Jeffreys's description (Linn. Trans. vol. xvi. p. 332.) is obtained along with *H. fulva*, but has always seemed to me wanting in sufficient characters to render it a distinct species. That the animal of *H. Mortoni* is lighter coloured than that of *H. fulva*, is not of consequence, as the young of various *Helices* are lighter coloured than the adults.

9. *Helix aculeata*, Mull. Gray, Man. 149. pl. 4. f. 33; Drap. p. 82. pl. 7. f. 10, 11.

H. spinulosa, *Mont.* p. 429. t. 11. f. 10.

Although the individuals of this *Helix* are generally but few in number where they do occur, the species is distributed over Ireland, and is found in moss, on fallen timber, under stones, &c.—out of "woods" I have as frequently met with it as in them: high up the limestone mountain of Ben Bulben (county Sligo) I have obtained it, but nowhere in Ireland have seen so many specimens together as in the limestone debris at Feltrim Hill near Dublin. From the marine sand-hills at Miltown Malbay, on the western coast, Mr. W. H. Harvey has supplied me with a few specimens, noting the species at the same time as "very rare." Mr. T. W. Warren of Dublin informs me that early last winter he procured sixty individuals of this species on one occasion near Portmarnock (county Dublin): some weeks previous to this time he found a few specimens at the place, and following the plan of the Rev. B. J. Clarke (see note to *Helix lucida*), he laid down sticks and stones that they might shelter under them, and with such success that he obtained this number. None of our Mollusca more than this requires the collector to be wide awake, else he may pass it by for a pellet of dirt or at least a seed. As one of the rarer species, it may be mentioned that out of Ireland I have found this shell at Dovedale, Derbyshire, the "dean" at Twizel House, Northumberland, and near Ballantrae in Ayrshire.

10. *Helix lamellata*, Jeffreys. Linn. Trans. vol. xvi. p. 333; Gray, Man. p. 150. pl. 5. f. 48.

H. scarburgensis, *Bean*. MS. *Alder's* Newc. Catal. p. 36; Turton, Man. p. 62.

This attractive species is widely distributed in Ireland, and is found on the decaying leaves and fallen branches of trees, in moss, and under stones in shady and generally moist situations. I first met with it in Sept. 1833, in the Glen at Holywood House, county Down, and soon afterwards in various localities throughout this county and Antrim; about O'Sullivan's cascade at the lower lake of Killarney, I had the gratification to find it in June 1834, and subsequently in the Glen of the Downs, county Wicklow. By the Rev. B. J. Clarke it has been obtained at La Bergerie, Queen's county, and by the Rev. T. Hincks of Cork, at Dunscombe Wood near that city, and likewise at Ballinhassig Glen between Cork and Bandon. Mr. Hincks remarks that the species appears to be far from uncommon in that district.

The following note relates to my most successful capture: April 30, 1837.—In Colin Glen (near Belfast) during an hour's patient search today, I collected from amongst a mass of the dead leaves of trees contained within the area of a square foot, twenty-one full-grown individuals of *Helix lamellata*, and about half this number of younger specimens; both shell and animals of these latter are lighter coloured than the old, indeed almost hyaline, and the lamellæ are apparent on the very youngest, which also exhibit the satin-like lustre of the adult. The mature animal is white beneath; the tentacula, back and sides greyish black; lower tentacula of moderate length, upper long and somewhat club-shaped.

In Auchairne Glen near Ballantrae, Ayrshire, I obtained this species in August 1839.

11. *Helix granulata*, Alder, Mag. Zool. and Bot. vol. ii. p. 107; Gray, Man. p. 151. pl. 3. f. 29.

H. hispida, *Mont*. p. 423. t. 23. f. 3.

This would seem to be a very local species with us. By Mr. W. H. Harvey I was in 1838 supplied with specimens, accompanied by a note, stating that the species had occurred to him in "moist places, and the rejectamenta of streams about Limerick and Ballitore, (county Kildare)." At the same time Mr. Humphreys, of Cork, reported it to me as found, but not commonly, at "Belgrove demesne, east of Cove."

12. *Helix sericea*, Muller*. Gray, Man. p. 153. pl. 11. f. 134.

In the rejectamenta of the river Lagan near Belfast, I have obtained specimens corresponding with those favoured me by Mr. Alder under this name. This shell is, in general form, size of umbilicus, &c. intermediate between *H. hispida* and *H. granulata*, but

* According to Perussac: see Alder, Mag. Zool. and Bot. vol. ii. p. 107.

hardly differs more from the ordinary state of *H. hispida* than the specimens of it common to the North of Ireland do, and which are considered by Mr. Alder and M. Michaud only varieties of the species bearing this name. I cannot look upon it otherwise than as a var. of *H. hispida*.

13. *Helix hispida*, Mull. Gray, Man. p. 154.* pl. 4. f. 41; Turt. Man. p. 57. f. 41.

This species is generally distributed over Ireland. It is one of the most common land shells in the North, and may be found under stones, fallen trees, decaying leaves, &c. from the sea-shore to the most elevated chalk districts, and both in moist and very dry situations. It is most variable in colour; from beneath the same stone I have procured specimens varying from a crystalline transparency to dark reddish brown, and in these differences the animal participates with the shell; like *H. rufescens*, Mont. and some other species, it occasionally presents a white band on the last volution; in the very youngest state this species is hispid, and quite depressed or flat above. The internal rib, in what to distinguish it from *H. concinna*, may be called the normal state of *H. hispida*, which I find in the North is generally wanting; on supplying Mr. Alder with specimens of these in April 1836, he observed that they were the most strongly marked varieties he had seen; and about the same time, M. Michaud, in acknowledging specimens I had sent him, remarked upon them as a very fine variety of *H. hispida*. The shells thus alluded to are of the most common form in the North of Ireland; and are larger, more depressed, and with the umbilicus comparatively wider than in specimens which I have found in various parts of England and Scotland, and which are similar to those that under the name of *H. hispida* have been sent me from Newcastle by Mr. Alder and from Lorraine† by M. Michaud; specimens the same as the English and French are likewise to be met with in the North of Ireland, but are rare comparatively with the others.

Note.—Sept. 17, 1837. On looking to the animals of full-grown specimens of this *Helix* collected at Wolfhill near Belfast, I could not perceive any difference between the inhabitants of the very hispid shells wanting the internal rib, and those having the rib and displaying very few hairs—the animals are commonly pale grey above and whitish beneath; in the very hispid shells they varied from this colour to black.

14. *Helix concinna*, Jeff. Gray, Man. p. 154. pl. 12. f. 135.

The shell alluded to under this name is that described by Mr. Alder, as "stronger, and with the hairs more deciduous than the usual form [of *H. hispida*]," Mag. Zool. and Bot. vol. ii. 107, and which I would add is generally more convex, and has an internal rib,

* The four wood-cuts in this page are very characteristic.

† The specimens, eight in number, from this locality, want the internal rib.

which in *H. hispida*, at least as I find it in the North of Ireland, is more often wanting than present. It commonly in Ireland takes the place of *H. rufescens*, Mont. where this is not found, as it has been remarked by Mr. Alder to do in England. In the northern half of the island it prevails abundantly; and as the *H. rufescens* decreases northwards, so does the *H. concinna* southwards; from extreme east to west they both range: in the central parts of the country, where both occur, they retain their distinctive characters, the *H. concinna* being smaller, more convex, and darker in colour than its ally.

Specimens of *H. concinna* from the neighbourhood of Bristol, favoured me by Mr. Jeffreys, are, as he now considers, certainly nothing more than *H. hispida*, and in its ordinary depressed form; still the *typical* specimens of these two *Helices* are very distinct in appearance, but through their varieties would almost seem to unite.

"*Helix circinata*, Fer."

I cannot perceive any difference between some of my North of Ireland specimens of *H. concinna*, when completely denuded of their hairs, and a shell so named, which I owe to the kindness of Mr. Alder.

15. *Helix rufescens*, "Penn." Mont. p. 420. t. 23. f. 2; Gray, p. 156. pl. 3. f. 28.

H. glabella, *Drap.* p. 102. pl. 7. f. 6.

This species is common to the southern two-thirds of the island: as far north as Banbridge in the county of Down it has been found.

16. *Helix Pisana*, Mull. Gray, Man. p. 158. pl. 4. f. 30.

H. cingenda, *Mont.* p. 418. t. 24. f. 4.

H. rhodostoma, *Drap.* p. 86. pl. 5. f. 13—15.

This fine and local species was first noticed as Irish in Turton's Catalogue (p. 8.), from specimens collected at "Balbriggan Strand," or as more correctly given by their discoverer M. J. O'Kelly, Esq. in the edition of Pennant's British Zoology, published in Dublin in 1818, "near Balbriggan, on the county Meath side of the stream that divides this county from Dublin," vol. iv. p. 369. By Mr. O'Kelly and Mr. T. W. Warren I have been favoured with specimens of *H. Pisana* from this locality. My friend R. Callwell, Esq. of Dublin, informs me that this species has been found at another, though not far distant station, by Mr. Joseph Humphreys, on the north side of the river Boyne, three miles east of Drogheda, and ten north of Balbriggan.

17. *Helix virgata*, Mont. p. 415. t. 24. f. 1; Gray, Man. p. 160. pl. 4. f. 31.

H. variabilis, *Drap.* p. 84. pl. 5. f. 11. 12.

In the north, east and south this species is found, but in the west I am not aware of its presence. It is a local species, occurs on the marine sand-hills at Ballycastle, in the north of the county Antrim; Dundalk (county Louth); Dublin, Wicklow, Youghal, and Cork;

and at the inland localities of La Bergerie, near Portarlington and Ballitore (county Kildare). *H. virgata* is one of the species which seems to follow no rule in the choice of its abode or in that of its associates, or rather whose absence from or presence in particular districts cannot be accounted for; it will be abundant on sea-banks at one place, and for a hundred miles again will not appear in similar localities. Some authors have remarked, from their own accurate observation in particular localities, that it is never found with *H. ericetorum*; and Mr. W. H. Harvey, in supplying me with notes of four inland and marine stations in which he had observed it, remarked, "I have noticed that this species is never found mixed with *H. ericetorum*, nor is it generally in the same neighbourhood;" yet not very far distant from one of those alluded to, both species are found in company*, and on the same plant.

In the collection of T. W. Warren, Esq. of Dublin, is a very fine series from one locality, Portmarnock †, presenting every variety of colour and bands that I have seen described, from the hyaline and opake white to the darkest brown. *H. ericetorum* has in similar variety been procured by this excellent and indefatigable collector at the same place, and *H. Pisana*, likewise differing, he possesses from its not far distant station:—one of the most beautiful of these three species is opake white with hyaline bands. At La Bergerie, near Portarlington, Mrs. Patterson of Belfast obtained a specimen of *H. virgata*, which both in form and colour bears a rude resemblance to the *Helix elegans* of Brown.

18. *Helix caperata*, Mont. p. 430. t. 11. f. 11; Gray, Man. p. 162. pl. 4. f. 32.

H. striata, *Drap.* p. 106. pl. 6. f. 18–21.

In Brown's "Irish Testacea" this species was noticed to be "not uncommon at Naas on mud walls," p. 526; and "Bullock in Ireland," was given by Dr. Turton as a habitat. (Conch. Dict. p. 51.) The *H. caperata* is in Ireland a very local species, is found in the southern half of the island, and appears to be plentiful where it does occur. From W. H. Harvey, Esq. I had specimens in 1833, which were collected by him at Glanmire near Cork; on "dry banks at Kilkee Castle near Ballitore, county Kildare," he had likewise procured the species. At Kingstown near Dublin, contiguous to Dr. Turton's station, it has been collected by Mr. Warren. At La Bergerie (Queen's county) it was a few years ago obtained in abundance by Mrs. Patterson of Belfast. Among the specimens brought from this locality (and presenting gradations in colour from the ordinary state to that of being almost wholly of a deep reddish brown) was one shell entirely of a pale amber colour, and transparent, the fine and

* Montagu mentions their so occurring.

† In Mr. R. Ball's cabinet, and collected by him here off a single plant of *Beta maritima*, are specimens of a pure white colour, others of a uniform dark chocolate brown, in addition to the more common state, white with brown bands and the reverse.

regular striæ rendering it very beautiful. Here, in addition to this species, *H. ericetorum* and *H. virgata* were found by Mrs. Patterson, and were abundant on the same plant, the *H. caperata* being the most plentiful.

The distribution of *H. caperata* seems rather anomalous; it is unknown to me in the North of Ireland, but on the walls of the houses in Portpatrick, one of the nearest parts of Scotland to this country, I have remarked it; about Ballantrae in Ayrshire it has not occurred to me; at the base of the cliffs at Salisbury Craigs near Edinburgh, I in 1834 procured it in abundance.

19. *Helix ericetorum*, Mull. Mont. p. 437. t. 24. f. 2; Gray, Man. p. 163. pl. 4. f. 37.

H. cespitum, β. *Drap.* p. 109. pl. 6. f. 16, 17.

This *Helix* differs from its nearest British allies, *H. virgata*, *H. Pisana* and *H. caperata*, in being pretty generally diffused over Ireland and the adjacent islands; most of the marine sand-banks around the coast claim it, but *H. virgata* in some places appears to its exclusion; it likewise affects the most inland localities, from one of which, near Portarlington, I have specimens so large as 9 lines in diameter. An exception to the more ordinary places of its occurrence may be mentioned; the ruins of Dunluce Castle, situated on the summit of an insulated mass of rock, considerably elevated above the sea. In localities in the north, but a few miles distant, and in every respect presenting a similar appearance, I have remarked the specimens in the one to be without exception either uniform in colour or very faintly banded, and in the other not one to be of an uniform colour, but all banded, and almost every individual darkly so. Draparnaud's *H. cespitum*, β. pl. 6. f. 15, 17., and Pfeiffer's *H. cespitum*, taf. 2. f. 24. and β. f. 25., are all very characteristic figures of our *H. ericetorum*, as is Rossmassler's var. f. 516. This author's *H. ericetorum*, f. 517. *a*. and *b*. likewise represent it. My friend Mr. E. Forbes informs me that in the Museum at the Jardin des Plantes, Paris, he in 1838 saw a young shell of this species marked "H. revelata, Belfast," and as presented by M. Michaud; it is doubtless one of a series of specimens, which, considering them to be *H. ericetorum*, I had the pleasure of sending to this naturalist some time before.

Mr. O'Kelly of Dublin, to whom the shell belongs that was described and figured by Capt. Brown in the Wernerian Memoirs as *Helix elegans*, and in his "Illustrations," &c. as *Carocolla elegans*, always considered it as an extraordinary state only of *H. ericetorum*, and as such noticed it in the Dublin edition of Pennant's Brit. Zool. vol. iv. p. 368. ed. 1818. To the same specimen Dr. Turton applied the term *Helix disjuncta*, Conch. Dict. p. 61. f. 63.; in his Manual (p. 40.) this author places it under *H. virgata*. See also Gray, Man. p. 161.

20. *Helix rotundata*, Mull. Drap. p. 114. pl. 8. f. 4—7.

Zonites rotundatus, *Gray, Man.* p. 165. pl. 5. f. 44.

Helix radiata, *Mont.* p. 432. t. 24. f. 3.

This very distinct and handsome species, both in form and colour, is common and universally distributed in Ireland. It affects situations varying from very dry to very wet, and may be found on rocks, under stones, fallen leaves, &c., but seems rather to show a predilection for decaying wood. I have more than once detected the *H. rotundata* in company with *Limaces* banqueting on some of the larger *Fungi*.

Specimens presenting much convexity are unfrequent, but in Shane's Castle Park (county Antrim) a full-grown one has occurred to me, whose height was equal to its diameter. At Holywood House (county Down) I once obtained two specimens of the beautiful crystalline variety. The young of this species differ very much in form from the adult, in being quite flat above and very convex beneath. In the stomach of a Blackbird (*Turdus Merula*), I once found ten full-sized specimens of this shell, in addition to five of *Achatina lubrica*.

21. *Helix umbilicata*, Mont. p. 434. t. 13. f. 2.

Zonites umbilicatus, *Gray*, *Man.* p. 166. pl. 5. f. 45.

Helix rupestris, *Drap.* p. 82. pl. 7. f. 7—9; *Turt. Man.* p. 60. f. 45.

Is commonly distributed throughout the southern three-fourths of Ireland, more especially over the great limestone belt which traverses the country:—"at its eastern commencement near Dublin, and at its extreme western verge, where it dips into the ocean" in the South Islands of Arran, I have found it in equal abundance. This *Helix* attaches itself more to one kind of rock limestone than any species hitherto treated of. With reference to what Montagu says of its habits, it may be remarked that I have commonly collected specimens on limestone debris resting on the ground and on loose stone walls or dykes. I have not seen any Irish specimens agreeing with Draparnaud's figure in tapering to the apex*; but all were of his var. "β. testa subdepressa, umbilico latiore." Mr. Gray's figure, as above quoted, is characteristic of this form: in the 1st ed. of Turton's Manual the other form was given. It is Drap. var. β. only that Mr. Jeffreys quotes (Linn. Trans. vol. xvi. p. 343.), and it is this which Montagu describes; his figure does not well represent either form.

22. *Helix pygmæa*, Drap. p. 114. pl. 8. f. 8—10; Turt. Man. p. 61. f. 46.

Zonites pygmæus, *Gray*, *Man.* p. 167. pl. 5. f. 46.

This species, so interesting from its minuteness, is indigenous to the more northern two-thirds of Ireland from east to west, and doubtless will be found by him who searches properly for it in the south. It is partial to shade and moisture, under stones in pastures may be procured, but is most readily and frequently obtained on fallen leaves, &c. in plantations. Since the Mollusca first claimed my

* Draparnaud's figure is very characteristic of specimens sent me from France by M. Michaud.

attention in 1832, this *Helix* has occurred to me in very numerous localities throughout the counties of Down and Antrim, in the county of Londonderry, and in the glen of the Downs in Wicklow. By Mr. Harvey it was sparingly found several years ago on the marine sand-hills at Miltown Malbay (county Clare); more latterly by Mr. E. Waller of Dublin, at Annahoe (county Tyrone), and by the Rev. B. J. Clarke, near Portarlington (Queen's county). At Twizel House, Northumberland, and Ballantrae, Ayrshire, I have collected this species. Draparnaud's description and figure of *H. pygmæa* are most characteristic.

23. *Helix alliaria*, Miller. Turt. Man. p. 56. f. 39.

Zonites alliarius, *Gray, Man.* p. 168. pl. 4. f. 39.

Although not an abundant species anywhere, is generally distributed over Ireland and her islands. From under stones at the sea-side to a great elevation on the mountains,—as near the summit of Divis, the highest of the Belfast chain—of Altavanagh, one of the mountains of Mourne in Down, and of Ben Bulben in Sligo, I have met with it—all situations, from the exposed sea-shore and mountain side to the umbrageous wood, seem alike to it. A greenish white variety, and the shell strong, is much more common in Ireland than the yellow, which is ranked the ordinary state: from under the same stone I have procured specimens of both colours. The animal is blackish. M. Michaud remarked, on acknowledging Irish specimens from me, that they were *H. nitida*, Drap., junior.

24. *Helix cellaria*, Müll.

Zonites cellarius, *Gray, Man.* p. 170. pl. 4. f. 40.

Helix nitida, *Drap.* p. 117. pl. 8. f. 23–25.

Is common, and distributed over Ireland. It has a predilection for wet situations, and even from the bottom of drains, partially covered with water, some of my largest specimens were procured in the north; the very largest Irish specimens — $7\frac{1}{2}$ lines in diameter — I have seen were found in drains within the city of Dublin, by Mr. T. W. Warren, to whom I am indebted for them. From the stomachs of the Blackbird and Starling I have taken perfect specimens of this shell.

25. *Helix pura*, Alder. Turt. Man. p. 59.

Zonites purus, *Gray, Man.* p. 171. pl. 4. f. 43.

Is distributed over Ireland; it is usually found in moss, under stones, &c., in sheltered situations, but on sea-side pastures likewise I have met with it. The yellowish horn-coloured variety has in all parts of the country occurred to me more commonly than the hyaline shell: the closely set, regular, and fine striæ render recent shells of this species very beautiful. M. Michaud, on acknowledging Irish specimens of *H. pura*, observed that they were *H. nitidula*, Drap.

26. *Helix nitidula*, Drap.*

Zonites nitidulus, *Gray, Man.* p. 172. pl. 12. f. 136.

* According to Mr. Alder.

This species, most characteristically described by Mr. Alder (Newc. Trans. v. 1. p. 38.), is common, and generally distributed over Ireland. In the north I have found it chiefly among mosses in glens and sheltered places. From two localities in this country I have seen *Helices* of crystalline transparency, and in form intermediate between *H. nitidula* and *H. alliaria*.

27. *Helix radiatula*, Alder.

Zonites radiatulus, *Gray, Man.* p. 173. pl. 12. f. 137*.

This polished and well-marked species at every age—for when very young the regular and strongly marked striæ serve to distinguish it—has since 1832 occurred to me in the county of Londonderry, in the neighbourhood of Dublin, and in very numerous localities throughout Down and Antrim. I have seen specimens which were collected at Annahoe (county Tyrone), by Edward Waller, Esq.; at La Bergerie (Queen's county), by Mrs. Patterson and the Rev. B. J. Clarke; and in the neighbourhood of Cork, by Miss Hincks. In the North of Ireland the transparent greenish white var. *H. vitrina*, Fer., as often occurs as the deep yellowish horn-coloured shell. That this *Helix* is more widely distributed in this country than would appear from the above notes, I have no doubt. At Dovedale in Derbyshire, and Ballantrae in Ayrshire, I have met with it, and by W. H. Harvey, Esq. have been favoured with specimens which he collected at the Falls of Clyde in 1832. In moist spots, in the wildest and bleakest localities, as well as in "woods," I have procured it. In the stomachs of four out of seven Starlings (*Sturnus vulgaris*) brought to a bird-preserver in Belfast at different periods during one winter, I found specimens of this shell, of which some were very fine and perfect. M. Michaud, when acknowledging specimens which I sent him, remarked that they were a var. of *H. nitidula*, Drap.

28. *Helix lucida*, Drap. p. 103. pl. 8. f. 11, 12.

Zonites lucidus, *Gray, Man.* p. 174. pl. 4. f. 38. and wood-cuts, p. 175†.

The *H. lucida*, described and figured by Draparnaud, and characterized by Mr. Alder in the Transactions of the Natural History Society of Newcastle (vol. i. part 1. p. 38), appears to be in Ireland, as in England, according to the latter author, "rare," and rather a local species. In the rejectamenta of the rivers Lagan and Blackwater, near Belfast, I in 1833 obtained a few individuals, and in Kilmegan bog (county Down) have since procured a series containing the living animal. I have seen specimens which were collected near Portarlington by the Rev. B. J. Clarke‡, and at Finnoe, in the north of

* The form is well represented here.

† Figures are hardly sufficient to enable us to determine this and some of the closely allied species from each other; actual comparison of specimens is almost requisite to ensure certainty.

‡ In a letter dated November 24, 1838, Mr. Clarke observed, in sending me specimens of *H. lucida*, "It is only under one stone I ever got this shell:

Tipperary, by E. Waller, Esq. Ours differ in no respect from English specimens supplied me by Mr. Alder, and are identical with specimens from Dauphiny, marked "*H. lucida*, Drap." by M. Michaud, to whom I am indebted for them.

29. *Helix excavata*, Bean, Alder.

Zonites excavatus, *Gray, Man.* p. 175.

Of this handsome shell I have yet seen but a single Irish specimen, which was obtained at Dunscombe Wood, near Cork, by Miss King of that city. On being shown to the Rev. T. Hincks, he at once identified it with *H. excavata*, and, with the kind permission of the owner, sent it to Belfast for my inspection; it in all respects agrees with English specimens of this *Helix* favoured me by Mr. Jeffreys and Mr. Alder.

30. *Helix crystallina*, Drap. p. 118. pl. 8. f. 13—18; Turt. Man. p. 58. f. 42.

Zonites crystallinus, *Gray, Man.* p. 176. pl. 4. f. 42.

Is generally distributed in Ireland, occurring in moss, under stones, upon decaying wood, &c., in dry and wet situations, though in the latter more frequently. Some adult specimens which I have collected have had but $3\frac{1}{2}$ volutions instead of $4\frac{1}{2}$ or 5, the ordinary number. Extensively as I have collected this *Helix* in Ireland, none but dead specimens would come under Draparnaud's var. "*β cornea subopaca.*" The animal is of a white colour.

Mr. Alder's views in reference to the last eight species (*Hyalinæ*, Fer.), are here adopted; but even the British species and their varieties belonging to this division seem not yet to be satisfactorily cleared up. The application of the same name too, by British and continental authors to different species, adds much to the confusion. Ireland possesses all the British species as distinguished by Mr. Alder, viz. *H. cellaria*, *H. nitidula*, *H. lucida*, *H. excavata*, *H. alliaria*, *H. radiatula*, *H. pura*, *H. crystallina*. Rossmassler's *H. nitens*, f. 524 and 525, are very characteristic representations of shells I possess from different parts of Ireland, and with his *H. glabra*, f. 528, so far as a figure and diagnostic description will suffice for judgment, I have specimens identical.

on leaving it undisturbed for about a fortnight I generally find one or two specimens under it. The field is marshy; and here I also find *Vertigo palustris*, but only within the space of a few square yards of the most marshy part. A little higher up, in the same field, *Vertigo pygmæa* is obtained. On going my rounds about once a fortnight, I procure a fresh crop of specimens of all three species from each spot!"

[To be continued.]

IV.—*Observations on Spiral Formations in the Cells of Plants.*

By Dr. M. J. Schleiden, Professor of Botany in the University of Jena*.

[With a Plate.]

The first discoverer of spiral vessels, it matters not whether Henshaw, Malpighi, or Grew, was without doubt astonished in the highest degree by their elegant tissue; and the more he became acquainted with them, the more varied the forms unfolded before the eyes of the ingenious observer, the more eagerly attention must have been directed to this apparently so remarkable formation. Thence it happened that, although not agreed respecting the kind and manner, a higher import with regard to vegetable life was generally assigned to these parts in opposition to the cellular tissue.

It was soon, however, found necessary to place the annular and porous vessels by the side of the spiral vessels; and not relying on the observation of actual facts, but chiefly induced by their representative occurrence in similar or analogous parts, and misled by a false explanation of that actually observed, Link assumed the metamorphosis of these formations into one another, without, however, at the time expressing decidedly whether an ideal or real metamorphosis was intended. How far, then, this was from a correct comprehension of the matter, is shown by his subsequent writings and annexed illustrations, in which he still explained the fibres as the thinner places, and the elongated pores as remains of the thicker fibres, a view which he still entertained in 1831, with the greatest confidence, for the porous vessels. A view differing much from Link's, but quite as erroneous, was supported by Kieser; and even Meyen, in his 'Phytotomie,' declared the pores to be the remains of torn spiral fibre.

What, on the other hand, is at present understood by the word metamorphosis of the spiral vessels, has nothing in common with the earlier views, except the name retained for convenience sake; and by this alone Meyen seems to be misled, when in his Physiology (p. 139) he ascribes to Link the merit of having first decidedly advanced this doctrine. This is the more evident, as Link himself, in his latest edition of the 'Philosophia Botanica,' is still far from comprehending all the facts belonging to this subject, and comprising them under a correct point of view.

If we at present express the fundamental conception of this doctrine thus: "The thickening layers deposited on the

* Translated from the Flora, No. 21 and 22. June, 1839.

primary simple cellular membrane have, on their first appearance, everywhere as a foundation an arrangement in a spiral band (or fibre) which becomes more or less distinct in various ways; and from this fundamental form are variously evolved all the numerous modifications of the so-called vascular and cellular walls, without, however, the one being to be regarded as a transitory stage of the other;"—then we must undoubtedly ascribe to Valentin (*Repertorium*, Part I.) the merit of having first advanced this doctrine in all its generality.

For along with those theories, observation had pursued her quiet course, and had found the porous and spiral formations in the cellular tissue also, and had gradually extended her discoveries so far, that at present it would perhaps be difficult, at least in the *Phanerogamia*, to point out any considerable masses of completely *developed* cellular tissue which do not manifest distinct traces of these textures.

I will here give a brief view of this doctrine from inquiries of my own, in which I lay claim to nothing new, more than those acquainted with the subject will ascribe to me; but, on the other hand, I dispense with the trouble of everywhere enumerating my authorities.

The cells of plants, including the so-called vessels, but with the exclusion of the laticiferous vessels*, the reducing of which to cells is still not at all clear to me, allow of two periods being distinguished in their life. In the first, that of their origin and isolated independent development, the membrane forming them grows, in its entire substance, by true intussusception. But as soon as the cells have adhered to form the cellular tissue and constitute the mass of a certain plant or its parts, this mode of growth either ceases entirely, or recedes so far into the background, that, from my observations up to the present time, I cannot venture to maintain its continuance; but neither can I deny it on account of the frequently very considerable expansion of the cells after the appearance of the succeeding formations. But in every case at present a new and by far predominant momentum is added, viz. that a new layer is deposited on the inner surface of the cellular wall, and indeed everywhere, in the form of one or more spiral closely wound bands, so that the coils, without continuity *inter se*, still mostly exhibit the completest contiguity. From personal observations, which, however, are still too imperfect to be detailed here, I think I may venture to conclude that originally there are always at

* Moreover, the old milk vessels of the leafless *Euphorbiæ* exhibit a composition of layers and spiral stripes exactly as the cells of the liber in the *Apocyneæ*

least two such bands present*, whose extremities at the end of the cells pass into one another, and in most cases, even very early, cohere *inter se* to a single one.

Hence, then, proceed all the varied formations of the cells and vascular walls, according to the different influence of the following momenta.

A. The most essential circumstance, in my opinion, upon which is also founded the division of all these textures into two large principal groups, that of the Spiroidea (I borrow this expression, which is very useful, from Link), and that of the porous formations, is the following:

Either the cell has, at the time when the thickening of its wall by spiral deposition commences, already attained its complete expansion, or not.

I. Let us, in the first place, consider the latter case. Here, then, a second momentum becomes of importance; it is the cohesion both of the fibre and the cellular wall, and of the coils of the fibre *inter se*; at the same time, therefore, the number of fibres is likewise of value.

a. Simple fibre (double in the sense above stated). The cell still expands considerably from the instant of its origin; some convolutions cohere early, others tear asunder: *annular vessels* (of which a more detailed description below) In this case the fibre is generally not at all, or but loosely united with the cellular membrane.

b. Simple or compound fibre, a still rather considerable expansion of the cell, slight, or no cohesion with the cellular membrane: *spiral vessels with broad convolutions, capable of unrolling.*

c. Simple or compound fibre, extremely slight expansion of the cellular membrane, generally intimate cohesion with it: *narrowly wound spiral vessels capable of unrolling, false tracheæ,* and in part the *striped* and *scalariform vessels* of older writers.

d. Compound fibre, moderate expansion of the cell, cohesion in some places of the convolutions *inter se,* generally also with the cellular membrane: the whole series of the forms of the so-called *ramified spiral vessels* to the *reticulate.* Hereto likewise belong a portion of the *striped* and *scalariform vessels* of the older writers.

In these last, as well as in all the preceding, the law, *that the more intimately the fibre coheres with the cellular membrane, the less this can expand,* appears to obtain.

* Corresponding to an ascending and descending current of the mucous formative substance.

II. But if the cell has, at the time when the spiral depositions have begun to form, already attained its complete expansion, a new and highly remarkable circumstance comes into action,—namely, that the formation of air-vesicles on the outer wall of the cell, between it and the adjacent ones, precedes the origin of the depositions; and the convolutions forming, closely lying one upon another, and in most cases rapidly cohering *inter se*, separate from one another cleft-wise at the place which internally corresponds to those air-vesicles. Since this process can be followed very far, and cannot, merely on account of the minuteness of the parts, be followed in several otherwise exactly similar formations, sound analogy advises us to extend it to all porous textures. This in general merely narrow slit, is often rounded by deposited formative substance, on which account the pore* appears the rounder the more the cell is developed; the longer, but more cleft-wise, the younger it is. Now to this division belong all *porous cells* and *vessels*, and likewise a portion of the earlier *striped* and *scalariform vessels*, which then only differ from those called porous by the length of the fissure of the pore.

B. A further momentum, which will here be but briefly noticed is, on the one hand, the form of the cell in the various intermediate stages between the two extremes of the small globular, and the much extended in length, in combination with an actual perforation of the primary membrane by absorption. To this head belong several formations, first indicated by Moldenhauer, and then correctly and fully described by Mohl, for instance, the leaf-cells of *Sphagnum*. But hereto more especially belong the difference between *cellular tissue* and so-called *vessels*, the latter being nothing more than cylindrical cells, generally situated in the same direction, with the terminal surfaces on one another, the septa of which are perforated in the most varied manner by absorption.

C. By far more important, however, is the following. Namely, in the vital process of the cell, spiral deposits are by no means at an end with the first layer; but they are repeated in many cases, almost as frequently as the volume of the cell permits. The rule then is, that the successive strata arrange themselves entirely according to the first, be this modified by the above-mentioned influences as it may, so that the places of the cellular wall not covered by the first deposit likewise remain free from all the succeeding ones. In this class is com-

* We have here omitted a note, which relates merely to the employment of *Tuffi* for *Pore*.—Edit.

prised the thickening of the annular and spiral fibres to such a degree that they appear as plates, which are placed with their narrow edge on the cellular wall; for instance, in the *Sphagnum*-cells, in the ligneous cells of the *Mammillariæ*, &c. Hereto also belong all the porous cells, with septa thickened in a stratified manner, for the knowledge of which we are chiefly indebted to Mohl.

But we are now already acquainted with some interesting exceptions to this rule, namely, that after the first spiral deposit has been altered by the expansion of the cell, a new layer is deposited on the entire inner surface, on fibre and on primary cellular membrane without distinction; but since this second layer stands in a different relation to the primary cellular membrane from the first, it also must, according to what has been above stated, adopt a different form, viz. the porous. These formations of distant fibres, between whose convolutions pores are found, are exhibited, in fact, by a number of dicotyledonous ligneous cells, especially of such plants as are subject to the strong antagonism of the period of vegetation and of winter sleep. Thus, for instance, *Taxus baccata*, *Tilia europæa*, *Prunus Padus*, &c. An allied phænomenon is also found in the epidermis of the pericarp of *Helleborus fœtidus*.

The most important of these views I had already expressed in my memoir, "Contributions to our Knowledge of Phytogenesis," in 'Müller's Archiv. für Physiologie,' 1838*.

But recently have I been able to take in hand Mohl's "Memoir on the Structure of the Vegetable Cellular Membrane"†, (Tubingen, September, 1837); and I found, to my very great joy, that we entirely agree in two important points: first, in maintaining against Meyen, that every indication of a spiral, fibrous, or porous structure, is a certain proof that we have no longer to do with the original simple cellular membrane; and next, in his position: "Fibre and membrane differ merely by their size, and by the form in which they occur," which essentially agrees with my view that the spiral is only a secondary difference of form in the product of the vital force (in the fibre substance, or more correctly, the membrane substance). The slight chemical modification which I have demonstrated in it is, at least, far more inconsiderable, and consequently less essential, than the

* Translated in Taylor's Scientific Memoirs, Part VI.

† The paper here alluded to, and Meyen's opinion on the same subject, have been placed before the English reader in Mr. Francis's translation of Meyen's Report on Vegetable Physiology for 1837.—Edit.

differences existing between the membrane of various plants and groups of plants *inter se*. Since Mohl and I have arrived at this result independently, and in part by a very different path, it is, in my opinion, a great presumption of its correctness. I gladly follow the steps of Mohl, whose memoir appeared some months earlier, as a confirmation only of a view already advanced; and would with joy always renounce in his favour all claim to priority, could I thereby for ever purchase an agreement of our convictions.

Scarcely more than in expression do Mohl and I differ in our views respecting the structure of the secondary deposits. If he admits an arrangement of the smallest parts in the direction of a spiral in the cases by far most frequent, and if I,—believing that I frequently have actually seen this arrangement even in cases where soon an apparent homogeneity occurs, and also as the changes produced by the expansion of the cells prove that the connexion of the molecules, in any other direction than that of the spiral, is in the younger stages almost nothing,—consider myself justified in speaking in all cases of a spiral striping or band, there is in this, with respect to the essential point, little discrepancy. I also believe that many differences of opinion, in subordinate points, will still disappear if Mohl keeps more accurately in view individual development, and especially pays more attention to the momentum of the expansion of the cells after the appearance of spiral deposits. Thus, for instance, in all my inquiries into the structure of the ligneous body, I have never contented myself with comparing the parts of different age of the same individual, but have constantly, as far as the material was at my disposal, at the same time pursued throughout a whole year the development of the same annular ring, by regularly repeated observations on the most varied parts of the plant. Highly instructive likewise is an accurate history of the development of the Spiroidea in the large Monocotyledonous vascular bundles, for instance, in *Arundo Donax*, where it must also be borne in mind not merely to compare on the same individual the younger with the older internodes, but to examine the homologous internodes on several individuals of different age. In this plant the spiroidea are situated in the perfectly developed fasciculus in a series radial from the axis to the periphery, arranged between the two large so-called porous vessels. The annular vessels, with the rings furthest from one another, are nearest to the axis of the internode, from thence towards the circumference the rings approach closer together, then pass

into broad threaded spiral vessels, and these lastly into narrow threaded spiral vessels*. Now if the history of the development of such a fascicle be investigated, it is found that those distant ringed vessels were first formed as spiral vessels; that then, during the gradual expansion of the internode to which the vascular bundle belongs, the formation gradually progresses towards the exterior, and the last spiral vessel remains a narrow threaded one, merely because the longitudinal expansion of the cells was already nearly at an end when the spiral deposition took place. The two so-called porous vessels, on both sides, are, during the whole of this formative process, cylindrical cells, filled with a grumose fluid, and placed on one another, their walls being perfectly simple; and only after the expansion in length is terminated, the pores originate on their parietes in the manner described, frequently only in the direction of cells in the interior of the vascular bundle. At the same time the perforation also of the septa takes place, according to the law which seems to me pretty generally valid, that the horizontal septa, or those slightly deviating from this position, are only perforated with a round aperture, the steeper ascending ones become ladder-like or reticulate; and lastly, the steepest are merely provided with usual pores.

I conceive it arises from not paying due regard to this history of development that Mohl has not yet recognised the true origin of the annular vessels. I will, therefore, briefly communicate here what I have observed on this point.

All that Mohl has objected in another place against the erroneousness of the common view likewise supported by Meyen, that a tearing of the spirals into single coils, and a cohesion of the torn ends to rings takes place, remains perfectly correct; and I was long convinced of the untenability of that view before I had ascertained the true origin. The difficulties of actual observation of the process lie in what follows:—Of all spiroidea the annular vessels originate exactly from those cells in which a spiral deposition is earliest formed, therefore at a time when they are infinitely small and delicate. This period occurs in the outermost internodes of the bud, and every anatomist is aware of the almost insurmountable difficulties which here oppose a more accurate examination. It is true, the delicate indications of the spirals have undoubtedly been recognised everywhere here as of the earliest forma-

* The same arrangement, with slight modifications, occurs in all vascular bundles of Mono- and Dicotyledons (fig. 12), only that often, in all Dicotyledons especially, porous formations succeed the narrowest spirals.

tion; but instead of observing their development into rings, many have only inferred that the annular vessels were of far later origin. Moreover, the formation usually proceeds, at the moment when the bud comes to development, so rapidly, that the observation of the intermediate stages is rendered almost impossible by it. For obtaining a successful result everything here depends on finding a plant in which all these difficulties exist in a slighter degree, and on which therefore the process may be accurately observed; if once a clear insight has been acquired in this way, it is easy to find oneself at home, even with the more difficult plants. I found for these inquiries the *Campelia Zanonia*, Rich. (frequent in most hothouses), and the subterranean stem of *Equisetum arvense* most advantageous.

If the very youngest internodes of the buds of the first-mentioned plant be examined, a single extremely delicate and densely-wound spiral vessel is found in all the as yet scarcely limited vascular bundles. In older internodes the convolutions of this vessel are found further distant from one another, and near it exteriorly a new-formed narrow-threaded spiral vessel. But if we consider in this period the first formed vessel more accurately, Plate (fig. 11.), it will be seen that all convolutions are not separated in the same manner from one another, but that almost in regular alternation two entire coils adhere firmly together, and one convolution is drawn out. In still older internodes the extension is found to be so far advanced, that the free coil loosened from the cellular membrane frequently reaches as a mere band with a steep ascent from the one ring formed of two closed convolutions to the other. On still further developed vessels this elongated coil is seen corroded by the reabsorbing action of the cell, and all the stages of transition, as they are represented in the Plate (from fig. 1 to 5,) are frequently found in the continuity of a single vessel. Lastly, on still older vessels, the connecting coil is already perfectly dissolved; but there may still be observed on the isolated rings the extremities of the previous spiral fibre (fig. 6, 7, *a*.). Even on highly developed vessels, we still find on the perfectly closed and smoothened rings, their composition of two coils now and then indicated by single delicate dark lines (fig. 8—10.). Exactly the same process may likewise be easily followed in the subterranean stems of *Equisetum arvense*; and in particular we frequently find long streaks in vessels modified as is represented in fig. 11. as the first stage of transition to the formation of rings.

I must still mention another point respecting which I do not at present agree with M. Mohl; it relates to the succes-

sion of the three layers in the formations we meet with in the ligneous cells of *Taxus*, in the so-called vessels of the Lime, &c. Undoubtedly the primary simple cellular membrane here also constantly forms the outer layer, as to which I agree with Mohl, and no doubt can remain in the mind of the careful observer, that with regard to time the spiral fibres are earlier formed than the porous layer. But I am rather inclined to doubt Mohl's statement that this latter is developed between the primary cellular membrane and the spiral fibre layer. Mohl brings forward no reasons in support of it; and this whole hypothesis seems to me entirely unnecessary, and if only on that account to be rejected. There is no fact which requires such an admission for its explanation; but many, on the contrary, speak against it. Since the cellular membrane itself passes in forming, like all secondary depositions, in the same manner from a fluid through a semi-fluid state to a slighter or greater firmness, a period must necessarily occur in the process adopted by Mohl, during the origin of the porous layer, in which the spiral fibrous layer must be as good as entirely separated from the original cellular membrane, by the newly-formed still semi-fluid layer; or at least could be separated from it by the gentlest manipulation. But I have never been able to notice a trace of this in *Taxus*; and in *Tilia* exactly the contrary occurs, in so far as here in the cambial cells the spiral coils which then still lie densely together, are, it is true, to be unwound with difficulty; but as soon as the development of the cell begins, and long before the occurrence of pores, they are already firmly united with the membrane. The contrary likewise appears to me to result from an accurate investigation of the above-mentioned cells on the germen of *Helleborus fœtidus*.

Also with regard to the porous cells of the *Coniferæ*, I differ in some minor points from M. Mohl. It is true I concur in the main point with Mohl's exposition in refutation of Meyen's theory; but I must nevertheless confess that I think I have seen how in *Pinus sylvestris* the cells of the cambium, even in the latest annual rings, are constantly divided by delicate black lines into narrow spiral bands previous to the formation of pores, (as matter of course with perfect homogeneity of the primary cellular membrane,) and how these, which I regard as the boundaries of the adjacent convolutions, first disappear on the formation of pores; probably glued to one another in a similar manner as the cells themselves, whose boundary lines likewise frequently become invisible in more advanced age; for when I isolated the cells by boiling in caustic potash, even those from the outermost

layers of the oldest heart wood constantly exhibited more or less distinctly these delicate stripes, and the pores then again appear merely as narrow clefts between two separating spiral coils.

In consequence of this view of mine of the constant generality of the spiral arrangement of the secondary depositions, I am also inclined, for the sake of consistency, to deduce the reticulated figures on the cells of the liber of the *Apocyneæ*, of the parenchymatous cells of numerous tropical *Orchideæ*, superposition *Dahlia* tubers, &c., rather from the adcumbency of two exceedingly delicate layers, formed of contrarily wound spirals, than to have recourse to quite a new mode of arrangement, which seems justified by no other peculiarity of the organ or of the occurrence. But I perceive it might be difficult here to bring direct observation in aid.

I may allow myself, in conclusion, some observations on the direction of the spiral coils. That all the reasons advanced by Meyen and Link respecting the difficulty of the determination do not at all affect the subject, is evident; for by reversion the relative position of two spirals is certainly not altered; but even the individual spirals remain wound right or left, in whatever way they are observed, of which Meyen may easily convince himself on a rod figured with a spiral. The being wound right or left of a spiral depends not merely on a different mode of viewing it, but on an internal difference in its mathematical construction. Moreover the sole actual difficulty mentioned by Mohl is not of such a nature that it cannot be overcome by a good microscope and some practice of the observer. In general I cannot agree with Mohl, that the spiral vessels principally occur wound to the right; I found some left-wound very frequently, and differences in various individuals of the same species. From my observations up to the present time, I have provisionally abstracted the following rule as at least very frequently valid. "In all spiral formations developing *cotemporaneously*, (comprising in the most general meaning all secondary depositions,) those which are situated *immediately* on one another in the direction of the radius are wound in the same direction; but those lying *immediately* on one another in the direction of the parallels to the periphery are wound in different directions. I will only mention here, as an instance, some spiroidea from *Cucurbita Pepo*; and I moreover appeal to the constant crossing of the pore fissures in contiguous parenchymatous and ligneous cells when observed on sections parallel to the medullary rays. But I must at once name, as a considerable exception, the peculiar short, thick, but delicate walled cells,

which in their interior contain plate-like rings and spirals raised on the narrow edge, which constitute nearly the entire mass of the wood of the *Mammillariæ, Echinocacti,* and *Melocacti;* and also occur in small quantity in the *Opuntiæ,* especially at the contractions of the joints, and which were first described by Meyen from *Opuntia cylindrica.*

EXPLANATION OF PLATE.

Fig. 1—10. Stages of the formation of the annular vessels from *Campelia Zanonia,* Rich. Explanation in text, page 42.
Fig. 11. Commencement of the formation into a ring of a spiral from *Equisetum arvense.*
Fig. 12. Spiroidea on a section through the medulla perpendicular to the bark; *a.* the side towards the medulla, *b.* that toward the bark.
Fig. 13. Spiroidea on a section parallel to the bark.
Fig. 14. The same as in fig. 13, with an intermediate series of cells corresponding to a right wound spiral.
Fig. 12—14. From young stems of *Cucurbita Pepo.*

V.—*Characters of new Genera and Species of New Holland* Cyperaceæ, Restiaceæ, and Juncaceæ. By Prof. C. G. Nees von Esenbeck.

[*Communicated by Professor Lindley.*]

A. Gunnianæ.

* Helothrix.

Locus inter Cyperaceas Acrolepideas.

Gen. Char. Spicula disticha, squamis duabus inferioribus minoribus sterilibus, duabus superioribus hermaphroditis. Stamina tria. Perigynii setæ 4 (an semper?) retrorsum scabræ. Stylus bifidus, a basi bulbosa deciduus. Caryopsis biconvexa, styli basi conica mucronata perigynioque stipata.

Inflorescentia: spiculæ axillares et terminales geminæ brevipedunculatæ.

Plantæ pusillæ habitu *Acrolepidis,* Schrad. aut *Eleogitonis,* in inundatis degentes, diffusæ. Culmus ramosus, flexuosus, foliosus.

*974. *Helothrix pusilla.* Culmi 2—4 poll. longi, flaccidi, geniculati, compressi. Vaginæ internodiis breviores, totæ herbaceæ, striatæ ore truncatæ. Folia linearia, angusta, obtusa, margine scabra, trinervia. Spiculæ vix lin. 1. longæ ex vaginis superioribus emergentes, pleræque geminæ, pedunculis inclusis, oblongæ, compressæ, virides cum purpura. Squamæ carinatæ, duæ inferiores triplo majores uninerves acutæ, duæ superiores ovato-lanceolatæ obtusæ trinerves, apice virides, basi pallidæ, deciduæ. Stylus bifidus, ramis longis tortis hirtis. Caryopsis candida,

* The numbers refer to the collections of dried plants given away by Mr. Gunn.

brevis, obovata, filamentis longis persistentibus, perigyniique setis antrorsum denticulatis albis æquilongis cincta.

An huc Isolepis fluitans, R. Br.?

956. *Cyperus sanguineo-fuscus*, N. ab E. umbella pluriradiata, radiis composite spiciferis spicis sessilibus patentibus, spiculis subulatis patulis 4—8-floris, squamis alternis ovali-oblongis obtusiusculis septemnervibus fusco-purpureis nitidis margine tenuissime albido dorso basin versus quandoque virescente, involucri hexaphylli foliis planis scaberrimis ternis foliisque scabris longissimis, involucellis setaceis (paucis) spica brevioribus, culmo trigono brevi.

Cyperus lucidus, Rob. Br. Fl. Nov. Holl. p. 218. n. 10. ed. N. ab E. p. 74?

Cyperus sanguinalis, Schrad. Cyp. Bras.

Adnot. Hic verus esse videtur *Cyperus lucidus*, R. Br. alter, in Sieb. Agrostogr. n. 500 evulgatus, nisi nova sit species, ad *Cyperum venustum*, R. Br. est revocandus.

420. *Isolepis propinqua*, R. Br. var. culmo $\frac{1}{2}$—$\frac{3}{4}$ ped. alto, spiculis 2—12 in glomerulo, squamis sanguineo-maculatis obtusissimis cum mucronulo. An distincta species?

976. *Isolepis margaritifera*, N. ab E., capitulo terminali oligostachyo laterali plus minusve cum terminali confluente, spiculis compresso-trigonis, squamis ovato-lanceolatis obtusiusculis carinatis uninervibus carina viridi lateribus fusco-sanguineis, involucro diphyllo capitulo longiori foliisque canaliculatis setaceis margine scabris, vaginis arctis ore nudo, caryopsi globoso-trigona albo-nitida lateribus convexis costulata sulcis serobiculatis.

Variat α. capitulis in unum confluentibus;

β. capitulo laterali remoto in pedunculos mono-distachyos soluto,

γ. spiculis in culmo singulis geminisve propter involucrum monophyllum erectum in speciem lateralibus.

Isolepis setacea, R. Br. Prodr. p. 222. n. 6.

421. *Isolepis cartilaginea*, R. Br. var. α. et β. Caryopsis trigona, tenuissime seriatim tuberculata.

573. *Eleocharis mucronulata*, N. ab E., culmis teretibus brevibus, vagina truncata cum mucronulo brevi herbacea, spica cylindracea densa multiflora, squama infima una et altera latis amplectentibus sterilibus reliquis ovato-oblongis obtusis dorso ferrugineo sanguineis, carina angusta viridula marginibus albo-membranaceis, stylo trifido, caryopsi obovata dorso gibbosa levissime tuberculata, styli basi pyramidali pallida, hypogynii setis sex caryopsi longioribus.

β. minor, squamis totis fere fuscis.

Ab *Eleocharite acuta* R. Br. differt squamis spicæ ovato-oblongis obtusis nec lanceolatis acutis.

Ab *Eleocharite multicauli* differt culmis multo crassioribus, *Eleocharite palustri* magis accedentibus, et spica duplo majore densiore basi squama una binisve latis rotundatis sterilibus cincta. Vagina longa, recta truncata, viridis, mucronulo vix lin. longo subulato herbaceo.

1013. *Cladium glomeratum*, R. Br. (genus proprium.)

Isolepidi propinqua species, probabiliter proprii generis. Squamæ bi-trifariæ, carinatæ, membranaceæ, pleræque fertiles. Stamina tria. Stylus trifidus basi subincrassatus, caryopsi trigona nitida concretus, a basi deciduus.

Fructus est *Elynanthi*, structura spiculæ potius *Isoschœni*, habitus *Cladii*.

575. *Chætospora concava*, N. ab E., culmo ancipiti altero latere plano altero convexiusculo marginibus lævibus, panicula elongata contracta decomposita.

Hepidosperma concavum, R. Br. Prodr. p. 234. (90.) n. 2 ?

GYMNOSCHŒNUS, N. ab E.

Spiculæ distichæ, bifloræ. Squamæ ventricosæ, læves, basi subtiliter nervoso-striatæ; inferiores quatuor minores steriles, quinta duplo major rigidior mascula involvens sextam hermaphroditam femineamve, extrema minor angustior sterilis inclusa. Setæ hypogynæ paucæ 1—3, graciles, antrorsum scabræ, ovario longiores. Stamina tria, filamentis longis planis, antheris linearibus mucronatis late dehiscentibus et tum magis oblongis. Stylus trifidus, basi conico-dilatatus, pubescens, cum ovario obconico compresso-trigono articulatus. Fructum non vidi.

Inflorescentia: capitulum terminale, bracteis brevibus latis interstinctum basique involucratum. Culmi aphylli.

Observ. 1. Ab *Arthrostyli*, R. Br. differt spiculis bifloris, squamis haud carinatis setisque hypogynis.

Observ. 2. Ad hoc genus pertinere videntur *Chætospora sphærocephala*, R. Br. et *anceps*, R. Br.

952. *Gymnoschœnus adustus*.

G. culmo compresso lævissimo apice incrassato, vaginis . . . ., spiculis tumidulis obtusis, squamis apice fuscis.

984. *Lepidosperma ensatum*, N. ab E., panicula densa pyramidali brevi, ramis decompositis imbricato-spiculatis, culmo ancipiti medio utrinque convexo marginibus scabriusculis, spiculis 1-floris, squamis acutiusculis scabris.

983. *Lepidosperma squamatum*, Labill. Spiculæ subbifloræ, squama antepenultima mascula, penultima abortu feminea, terminalis abortiva.

Setulæ tres, retrorsum scabræ, inter stamina.

Igitur *Chætosporæ* potius generis quam *Lepidospermatis*.

962. *Restio complanatus*, R. Br. Novum genus. Spicula undique imbricata squamis membranaceis setacco-cuspidatis. Perianthium pedicellatum quadripartitum, laciniis lateralibus angustioribus. Stamina duo basi dilatata cartilaginea, lateribus ovarii adposita. Stylus bifidus. Utriculus compressus, retusus, sæpe obliquus, monospermus.

Culmus simplex, complanatus. Vaginæ membranaceæ, truncatæ, aphyllæ, limbo lacero. Spiculæ in panicula racemosa brevi angusta.

599. *Calorophus elongata*, Labill. ♀ Rostio lateriflorus, N. ab E. in Sieb. Agrostoth. n. 29. et R. Br. Prodr. Culmi filiformes, longissimi. Vaginæ ore barbatæ. Spiculæ laterales, distantes, bractea setacea basi vaginante ciliata cinctæ, subsessiles. Squamæ propriæ tres, membranaceæ, ciliatæ, obtusæ. Sepala sex, tenuissime membranacea, subrotundo-ovalia, obtusa, æqualia, ciliata, nucem æquantia eidemque arcte adpressa. Nux trigona, lævis, stigmatibus tribus in spicas revolutis persistentibus coronata.

Hæc vera femina est *Calorophi elongatæ*, Labill. Quam tamquam plantam femineam in eadem tabula pinxit Labillardière (fig. 2.), ad *Hypolænam exsulcam*, R. Br. aut aliam hujus generis speciem pertinere puto.

B. Drummondianæ; *ad Flumen Cygnorum lectæ.*

1. *Chorizandra multiarticulata*, N. ab E., capitulo globoso exserto, squamis obtusis imberbibus, culmi articulis profunde striatis diametro sua paulo longioribus. Culmus magis ac in *Ch. Cymbaria striatus*, articulisque duplo brevioribus vel statu sterili dignoscendus.

2. *Isolepis cartilaginea*, R. Br. var. spiculis 1—8 pallidis, culmo semipedali, foliis plus minus elongatis. Culmus compresso-triqueter. Involucrum sub capitulo polystachyo diphyllum.

3. *Elynanthus bifidus*, N. ab E., culmo filiformi striato compressiusculo basi bulboso foliatoque, foliis canaliculato-filiformibus, spiculis solitariis binisve pedunculatis terminalibus bifloris, bulbo styli in caryopsi muricato-rugoso.

4. *Elynanthus capitatus*, N. ab E., culmo obtuse trigono compressiusculo lævi basi bulboso foliatoque, foliis convoluto-canaliculatis, vaginis margine membranaceis laceris, capitulo terminali polystachyo, spiculis unifloris squamis quatuor inferioribus cuspidatis.

5. *Elynanthus australis*, N. ab E., culmis filiformibus lævibus foliosis, vaginis truncatis folio convoluto-filiformi basi rigide ciliolato multo brevioribus, ligula brevissima truncata, spiculis spicato-fasciculatis in panicula angusta ramis quinis singulisve bractea brevioribus dispositis lineari-lanceolatis unifloris, squamis sterilibus bracteolisque setaceo-cuspidatis.

Affinis *Elynantho cuspidato* et *gracili*, at charactere suo distinctus.

6.? *Elynanthus octandrus*, N. ab E., culmo compresso bulboso, foliis omnibus radicalibus linearibus planis, spiculis spicatis, spicis axillaribus solitariis, inferioribus remotis superioribus in spicam terminalem compositam coëuntibus, bracteis foliaceis culmi apicem superantibus, rostro fructus ovato crasso.

7. *Schœnus fascicularis*, N. ab E., culmo simplici compressiusculo exsulco lævi aphyllo, vaginis baseos ore subbarbatis foliolo longioribus, spiculis fasciculatim confertis brevissime pedicellatis falcatis subtrifloris, squamis margine ciliatis.

Proximus *Schœno brevifolio*, a quo differt inflorescentia plerumque breviori, vix pollicari, ex paucis fasciculis approximatis conflata rarius iisdem paullo magis discretis, spiculis falcatis subsessilibus, et vaginæ foliiferæ ore, saltem in juventute, barbulato nec nudo. Structura spiculæ omnino ut apud Kunthium (En. II. p. 335.) sub *Sch. brevifolio* sed squamæ 4. inferiores vacuæ, 5, 6, et 7 fertiles.

Isoschœnus, N. ab E.

Spicula disticha, squamis æqualibus, inferioribus fertilibus, superioribus sterilibus. Rhachilla fructus curvato-sinuata. Perigynium nullum. Stamina tria, filamentis persistentibus peracta anthesi elongatis. Stylus basi æquali deciduus, trifidus. Caryopsis nucamentacea, sculpta, a flexuris rhachillæ diutius retenta.

Inflorescentia capitata aut per fasciculos axillares anguste paniculata. Culmi basi aut etiam superiora versus foliosi. Vaginæ ligulatæ. Folia angusta, filiformia aut canaliculato-filiformia.

8. *Isoschœnus Armeria*, N. ab E., spiculis capitatis, culmo lævi basi unifolio.

9. *Isoschœnus acuminatus*, N. ab E., Schœnus acuminatus, R. Br. Prodr. p. 231. et N. ab E. (87.) n. 6.—spiculis fasciculato-ternis bi nisve lateralibus in panicula angusta dispositis, culmo foliato.

10. *Isoschœnus flavus*, N. ab E., capitulo terminali, culmo rigido subangulato scabro basi foliato foliis filiformibus canaliculatis scabris breviori.

Culmus tripollicaris, quam pro altitudine crassior.

11. *Chætospora aurata*, N. ab E., culmo nudo compresso basi folioso, foliis subsetaceis canaliculatis incurvis, capitulo terminali globoso involucro di- triphyllo breviori, spiculis subbifloris squamis imberbibus carina scabris, perigynii laminis lineari-lanceolatis planis ciliatis.

Similis *Ch. curvifoliæ*, sed evidenti differt charactere.

Culmus spithamæus et ultra, compressus. Squamæ atro-sanguineæ, basi aureo-flavæ, omnes setaceo-cuspidatæ, carinatæ. Caryopsis (nux) obovata, obtusa, scabra, squamulis 7—8 æquilongis strigilosis appressis cincta. Stylus trifidus. Stamina 3.

12. *Chætospora cygnea*, N. ab E., culmo compressiusculo estriato basi foliato, vaginis ore barbatis, spiculis binis ternisve lateralibus sessilibus involucro culmum continuante brevioribus, squamis trifariis enervibus interioribus margine puberulis, laminulis hypogynis fructu duplo brevioribus ciliatis, rhachilla fructus apice incurva.

Juncum filiformem gracilem refert.

13. *Caustis dioica*, R. Br. Est hermaphrodito-dioica pistillis plerisque sterilibus. Ad hujus formam sterilem spiculis in ramulis

recurvatis solitariis, nec vero ad *Caustin flexuosam*, spectat *Caustis recurvata* mihi (olim *Restionis* nomine a Siebero distributa); quod quomodo scribæ, nec mea culpa evenerit, ipse paulo post in eodem Diario botanico Ratisbonensi exposui. Sed Kunthius, qui omnia scit, ubi videor erravisse, ea sola nescire videtur, quæ ad avertendam erroris falsam speciem feci. Id quoque monendum est, *Melachnen Sieberi* non ad *Caustin flexuosam*, sed ad *Didymonema filiforme* Presl. pertinere, et igitur longe distare a Causti genere.

14. *Restio curvulus*, N. ab E., culmis apice ramosis fastigiatis, ramulis compressis curvatis apice spiciferis, spicis masculis approximatis (paucis) sessilibus oblongo-lanceolatis, squamis cuspidatis vaginisque nudis, his mucronatis, perianthiis (♂) 6-glumibus.

15. *Lepyrodia macra*. N. ab E., culmis simplicissimis flexuosis vaginis foliatis strictis, spica simplici pauciflora.

Culmi spithameæ, curvati, subspongiosi, graciles. Vaginæ herbaceæ, striatæ, truncatæ, ore membranaceo, foliolo subulato obtuso 3—4-lineari erecto. Vaginæ superiores basi solubiles ut in Restionibus, sed flores intra squamam bibracteolati. Spica tam mascula quam feminea 3—4-floræ. Bracteæ communes oblongæ, membranaceæ. Sepala æqualia. Flos masculus (defloratus) angustior.

16. *Lyginia imberbis*, R. Br. ♀ Schœnodum tenue, Labill. t. 229. f. 1. Ovarium, in stylum longum crassum apice solummodo trifidum attenuatum, monospermum videtur. Perianthium sexfidum, laciniis oblongo-lanceolatis muticis membranaceis æqualibus. Bracteæ late ovatæ, setaceo-mucronatæ, fuscæ. Spica terminalis solitaria. Reliqua ut in charactere naturali a cl. Brown tradito. Vaginæ aristato-cuspidatæ. Culmi lutei, læves, simplicissimi.

17. *Anarthria grandiflora*, N. ab E., culmis simplicibus teretibus foliisque compressiusculis striatis, racemo composito denso oblongo, floribus masculis nutantibus, bracteolis geminis, sepalis lanceolatis compresso-carinatis. Squamæ bracteales longæ, lanceolatæ, ♀ racemo minori contracto, ramis 2—3 minus divisis rigidis, floribus minoribus sepalis rigidis.

18. *Anarthria humilis*, N. ab E., culmis simplicibus teretibus filiformibus foliisque compressis striatis, racemo di- trifloro, bracteolis singulis, sepalis lanceolatis obtuse carinatis.

Culmus semipedalis. Sepala lanceolata, subulato-acuta, brunnea.

19. *Leptocarpus canus*, N. ab E., amentis in glomerulos distantes laterales dispositis, squamis acuminatis, rhachilla pilosa, perianthii glumis omnibus margine lanatis, culmo simplicissimo cano. Culmi 1—1½-pedales, teretes. Vaginæ fuscæ, mucronatæ. Spiculæ geminæ—quaternæ, a medio culmo in glomerulos distantes agglomeratæ, bractea setacea brevi-vaginata cinerea suffultæ. Flores bibracteolati.

20. *Leptocarpus spathaceus*, R. Br. Distinctum genus. Stylus trigonus, crassus; ovarium triangulare, in stylum decurrens. Flores fasciculati (quos dicunt) terni quaterni, capituliformes; spiculæ squamis suffulti. Sepala mucronata.
21. *Desvauxia Drummondiana*, N. ab E., receptaculo subpaleaceo, stylis 6—7 basi connatis valvulis asperis infra apicem obtusum aristato-mucronatis mucrone valvula sua duplo breviori, foliis capillaribus scabris scapo glabro brevioribus.

D. Billardieri, R. Br. affinis.

VI.—*On the Structure of the Stigma in* Mimulus *and* Diplacus. By Mr. Joseph Henderson.

To Richard Taylor, Esq.

Sir,

I have observed a very singular instance of irritability in the stigmata of some species of *Mimulus* and of one species of *Diplacus*, a genus recently separated by Nuttall from *Mimulus*. As I have nowhere seen any mention made of the existence of the phænomenon of irritability in any of these plants, you will perhaps favour me, should the fact not have been before observed, by inserting this notice in the Annals of Natural History*.

In making an experiment to ascertain if *Diplacus puniceus* would hybridize with *Mimulus cardinalis*, I found on applying the anther of the latter to the bilamellate stigma of the former, that the plates—which in their natural position are reflexed—immediately collapsed, and inclosing the mass of pollen grains that had fallen on them, pressed firmly against each other. The intimate connexion between the genus *Diplacus* and *Mimulus*, induced me to try if this unexpected property existed also in stigmata of the latter genus, and I found it to be present in *Mimulus cardinalis*, *roseus*, *luteus* and *moschatus*, all the species of *Mimulus* growing here. The movement in all these cases follows the touch as rapidly as in *Mimosa pudica*; the stigma, however, is more active when the flower is first opened. If the stigma is touched with a pin or any other instrument, the plates, after collapsing, will revert to their natural position, generally in less than two hours; but if pollen is interposed between the plates, they remain closed a much longer time.

In the 27th Number of the Annals of Natural History there is a note on the movement of the style of *Goldfussia anisophylla* by Professor Morren of Liege, in which he refers the

* The excitable property of the stigma of *Mimulus* and *Diplacus* is a fact well known, but the peculiar structure of that organ has not been before observed.—Ed.

cause of the movement to excitable globules contained in the fluid of what he calls the cylindrenchyme of the stigma; this fluid being carried to the extremities of the cylindrenchyme, these extremities are dilated, which causes the stigma to bend in one direction; but when the stigma is touched, the globules and the liquid flow back to the bottom of the cylinders, and in this case, this side becoming the longest, the style erects or bends in an opposite direction: M. Morren therefore refers the cause to the excitability of a vital fluid.

In examining the stigmata of *Diplacus puniceus* and the different species of *Mimulus*, in order to ascertain if they contained any analogous structure to that described by M. Morren, I found the inner surfaces of the stigmata in all composed of elongated cylindrical cells, the ends of which are free and prolonged into tapering jointed glandular hairs: these hairs, which thickly clothe the surface of the stigma*, are dilated at the extremities, and at the base where they arise each one forms a thickened elbow, with the cell of which it is the termination.

When the plates of the stigma are in their natural position these hairs are erect, but on examining them after the plates had collapsed, I found them gathered together into bundles of a dozen or more with their points drawn closely together, and in some cases twisted spirally round one another: in the stigma of *Mimulus roseus* each hair was recurved over its own cell. It is easy to conceive that such a movement of the hairs, forming as they do the extremities of the cylindrical cells, would cause the stigma to incline inwards, and it is probable that the natural cause of their movement is, as M. Morren asserts, the reaction of an excitable fluid.

I am, Sir, your obedient Servant,

Joseph Henderson.

Milton, near Peterborough, July 13, 1840.

VII.—*A Note upon the Genus* Decaisnia, *Ad. Brong.* By Professor Lindley.

This genus, founded upon a Brazilian plant from the Island of St. Catharine's, was published by M. Adolphe Brongniart in the Botanical part of Duperrey's Voyage. It was admitted into the *Neottideous* tribe of Orchidaceæ in my Natural System of Botany, and by Endlicher has been equally adopted as a genus of the *Arethuseous* tribe.

* In the stigma of *Goldfussia anisophylla* these hairs are shorter, more thickly crowded together, and less dilated at the points than in stigmata of *Mimulus* and *Diplacus*.

In examining critically the genera of *Neottideæ*, I have been surprised to find that this *Decaisnia* is identical with *Prescottia*; a circumstance easily overlooked, since the species is somewhat different in habit from any of the *Prescottias* hitherto published, and is moreover so represented in the figure that accompanies M. Brongniart's memoirs as not to call to mind the peculiar cucullate fleshy lip and revolute floral envelopes of *Prescottia*. I find, however, that both these characters really exist in *Decaisnia*.

M. Brongniart relies upon the adhesion of the lateral sepals and labellum into a pouch, two pollen masses, and a pair of auricles to the anther-bed, as characteristic features of *Decaisnia*; but the first is equally the attribute of all *Prescottias*, and the others are of little moment. I am not able to ascertain whether the granular pollen masses are simple or two-lobed, although I possess an excellent specimen of *D. densiflora*, through the liberality of M. Ad. Brongniart, so very difficult is the examination of the minute fructification of these plants: but even if the pollen be as is represented in the figure in Duperrey's Voyage, it would not constitute, *per se*, a generic difference from *Prescottia*; and with regard to the auricles of the anther-bed, they occur in *P. plantaginea* itself, and in *P. stachyodes* form a still more striking feature in that part.

Although the name *Decaisnia* must therefore be abolished, I do not think it desirable to restore it to those Indian *Neottideæ*, originally so called by me, and afterwards, at the request of M. Brongniart, altered to *Cnemidia*, for this would be to increase the confusion of names. It will, I think, be better that some new genus should be taken to commemorate the distinguished merits of M. Decaisne.

VIII.—*On a new British Species of* Colymbetes. By Charles C. Babington, Esq., M.A., F.L.S., F.G.S., &c.

The water Coleoptera of South Britain have now been so carefully studied, that it is far from probable that any new species should yet remain to be discovered amongst the larger forms; it is therefore with the greater satisfaction that I now introduce to the entomological readers of the Annals of Natural History a new species of *Colymbetes*, discovered by the Rev. J. L. Brown in Horning marshes, Norfolk, in the month of March, 1839, and again found in the same place in March 1840. This insect appears referable to the section *Agabus* of Erichson, in which the labial palpi have the third joint a very little shorter than the second, the claws being equal and

moveable, and the three basal joints of the anterior tarsi in the males being dilated with small acetabuli; and to the fourth division of it, where the four basal joints of the posterior tarsi are ciliated beneath in the males.

Colymbetes (Agabus, §. 4.) rectus, (*Bab.*). Linear-oblongus, subconvexus, fusco-niger, subtilissime longitudinaliter strigosus, antennis pedibusque ferrugineis, elytris apice punctato et strigis tribus irregularibus punctorum impressis.
(Long. corp. $3\frac{1}{2}$; lat. $1\frac{3}{4}$ lin.)

Oval oblong, with the sides nearly parallel and straight, slightly broader behind the middle of the elytra, rather convex, fuscous black above and beneath, head nearly smooth, with two large deep punctures in front and two small deep foveæ before and rather above the eyes, which have a narrow rugose line along their upper margin, crown with two round red spots. Thorax covered with minute anastomosing longitudinal striæ, which are much stronger near to the lateral margins, a shallow depression next to each of the hinder angles, from each of which an irregular line of punctures extends along the hinder margin half-way to the scutellum. There is also a line of irregular impressions along the whole of the anterior margin, and a faint trace of a dorsal channel. Scutellum smooth. Elytra having their sides in continuity with the thorax, covered throughout with minute longitudinal anastomosing striæ, and having three irregular rows of punctures upon each, with distant scattered dots between them, which become more numerous towards the apex; also an irregular row of numerous punctures on the outer margin. Mouth, antennæ, and palpi ferruginous; the labial palpi with the second joint rather longer than the third. Legs ferruginous, with the thighs darker: tarsi of the male with the three basal joints of the anterior dilated, and the four of the posterior ciliated beneath; claws of equal length upon each tarsus, but those of the posterior very minute.

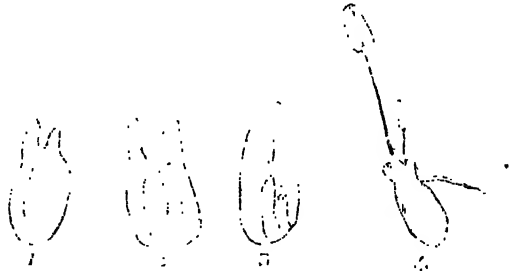
Inhabits Horning marshes, Norfolk, and was found by the Rev. J. L. Brown in March, 1839 and 1840.

Closely resembling *C. branchiatus* (Bab.) in form, but belonging to a different subdivision of the section, and in that the colour is blueish black, the upper surface almost smooth, the legs, antennæ, and palpi are much darker, and there is also a faint trace of a transparent line upon each of the elytra.

St. John's Coll. Cambridge, July 11, 1840.

IX.—*Additional Observations on the Gemmæ of* Polygonum viviparum. By George Dickie, Esq., A.L.S., Lecturer on Botany in the University and King's College, Aberdeen.

A description of the Gemmæ of *Polygonum viviparum* having been already given in the 32nd Number of the Annals, the following account of their original development, and of their manner of growth, will serve to complete the history of these remarkable bodies. Having procured in the early part of the season, from a locality in this neighbourhood, very young flower stems, both flowers and gemmæ were carefully dissected; the former (which invariably occupy the summit of the flower stems) were much more advanced than the latter. Fig. 1. represents one of these magnified. Two nearly conical processes are seen placed side by side; on separating these, two similar bodies are seen in the interior alternating with the former: by tearing asunder these last, two others are seen similarly inclosed (figs. 2. and 3.); the difference in length



and breadth of the two innermost is now more conspicuous than in the two outer. Each of these concentric bodies may be considered, the one as a young leaf and the other a bud in its axil. They are all of a very delicate texture and pale colour; at this period the mass of cellular tissue enclosing starch grains is not developed, neither have the pink cells alluded to in the former paper yet appeared. The bud at the apex of each body is therefore first formed, and afterwards a quantity of fecula is stored up at its base.

A considerable number of perfectly formed gemmæ, shortly after being gathered from the mature flower stem, were planted in a pot of mould, the apex of each alone protruding from the soil; they were daily supplied with water. A few days after being planted, a young leaf appeared at the summit of each, the petioles made rapid progress, and some reached nearly the length of an inch a week after the first appearance of the

leaf (fig. 4.). Up to this period no roots are protruded; the young leaf is nourished solely by imbibition and by the fecula stored up at its base. It generally happens that no root is protruded until a second leaf has appeared; I have, however, seen a few cases in which a radicle appeared while only one leaf was yet visible. In most instances, shortly after the appearance of a second leaf, a root is protruded from the gem and always at one side near its neck (fig. 4.). This root is conical, at first entirely cellular and covered with minute fibrils; it constitutes the root of the plant, and the fibres on its surface are spongioles. A perpendicular section shows that this root has an organic connexion with the youngest of the leaves when two are produced previous to its appearance. May it not be admitted that these remarkable bodies present a miniature illustration of Professor Morren's investigations regarding the functions of the Pith in Plants? See Annals, No. 92, vol. iv. pp. 73–87.

X.—*On* Lychnis diurna *and* vespertina *of Sibthorp.* By Charles C. Babington, Esq., M.A., F.L.S., F.G.S., &c.

Thinking it right to bring before the public as early as is consistent with accuracy, any information that I may obtain concerning what may be denominated the contested parts of British descriptive botany, I make no apology for publishing specific characters for the two species of *Lychnis* which have been usually included under the name of *L. dioica.*

In both of them I find a tendency to change in the colour of the flowers; those of *L. diurna*, although most commonly red, may yet be sometimes found of so light a pink as to be called white; and those of *L. vespertina*, which are usually white, vary occasionally to pink. In both the flowers are usually diœcious, but plants of each of them are at times found with perfect stamens and pistils in the same flowers. For this reason I propose to drop the name of *dioica* and to adopt those conferred by Sibthorp.

I have not found any tendency to variation in the characters drawn from the forms of the calyx-teeth and the capsule, and the direction of the teeth of the latter.

I make no claim to originality in these characters, all of which have, I believe, long been detected and employed upon the continent; but only wish to bring them before our younger British botanists, to whom I suspect that they are totally unknown.

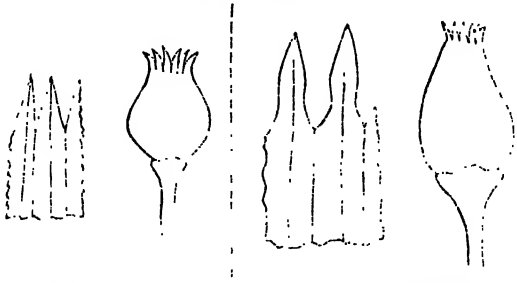
1. *L. diurna* (Sibth.). Petals half bifid crowned, stem, leaves, peduncles and calyces villose, leaves ovate-acute, flowers dichotomously panicled dioecious, teeth of the calyx triangular short, capsule nearly globular with reflexed teeth.

L. dioica, *α. Linn. Sp. Pl.* 626. *Sm. Eng. Fl.* 2. 328. *Eng. Bot.* t. 1579.

L. diurna. *Sibth. Oxon.* 145. *Koch. Syn.* 107.

L. sylvestris, "*Hoppe*" *DeCand. Prod.* 1. 386.

Flowering in May and June. Flowers usually red; rarely nearly white. The length of the teeth of the calyx is variable, but I believe the form to be constant.



L. diurna, *Sibth.* L. vespertina, *Sibth.*

2. *L. vespertina* (Sibth.). Petals half bifid crowned, leaves, peduncles and calyces hairy, leaves ovate-lanceolate, flowers dichotomously panicled dioecious, teeth of the calyx linear-lanceolate elongated, capsule conical with erect teeth.

L. dioica, *β. Linn.* 626. *Sm.* 328. *Eng. Bot.* 1580.

L. vespertina. *Sibth.* 146. *Koch.* 107.

L. dioica. *DeCand.* 386.

Flowering from June to September; not commencing so soon, and continuing in flower much longer than the last. Flowers usually white, but rarely reddish. In the figure in Eng. Bot. the teeth of the calyx of the female flower appear to me to be those of *L. diurna*, although the rest of the figure agrees with *L. vespertina*.

St. John's Coll. Cambridge, July 29, 1840.

XI.—*Some Observations on the Origin and Direction of the Woody Fibre of the Stems of Palms.* By George Gardner, Esq., Surgeon*.

The hidden remains of former worlds which the exertions of geologists are daily bringing to light, are no less subjects of wonder to the unlearned, than objects which give rise to spe-

* In a Letter addressed to J. E. Bowman, Esq.

culations of the most interesting nature in the mind of the philosopher, and enable him by induction to give a definite and harmonious idea of the former condition of the globe. It was only from the intimate knowledge which the immortal Cuvier possessed of the anatomical structure of the living animals which now people the earth, that he derived the power of giving all but life to a host of its former inhabitants, whose existence and real characters were before totally unknown. If such knowledge is requisite for throwing light on the remains of animals, it must be obvious that the relics which survive of the extinct vegetation of the earth can only be successfully investigated by those who have attentively studied the anatomical structure of that which now covers its surface. To the geologist, knowledge of this kind must be of the utmost value, since we now know that many tribes of plants are as readily distinguished by the structure of their stems, as by the characters which are given to them by their organs of fructification. Thus all the individuals of the natural order *Coniferæ* are immediately recognized by there being scarcely any mixture of vascular tissue among the woody fibre of their stems, as well as by their ligneous tissue being marked with circular discs, which are supposed by Kieser and several other vegetable physiologists to be pores, but which, from apparently good reasons, Dr. Lindley considers to be semitransparent granules. *Cycadeæ* are recognized by the same want of vascular tissue as in *Coniferæ*, and by their wood being marked in the same manner; but the zones of wood are separated by a layer of cellular substance resembling that of the pith, and often as thick as the zones themselves. The shrubs which constitute the natural order *Calycantheæ* have square stems, with four woody imperfect axes, surrounding the usual central one; and the investigations of those who are now devoting themselves to such inquiries may probably lead to the discovery of distinguishing characters in the stems of other well-marked tribes of the vegetable kingdom.

These remarks have been occasioned from reading the account of the anatomical structure of *endogenous plants* given by Dr. Lindley in his 'Introduction to Botany.' After stating the general plan on which the stems of these plants are formed, the following paragraph occurs at page 82 of the second edition of that work: "The investigations of Mohl appear to show that this view of the structure of *endogens* requires some modification. According to this observer, every one of the woody bundles of a palm-stem originates in the leaves, and is at first directed towards the centre; arrived there, it follows

the course of the stem for some distance, and then turns outward again, finally losing itself in the cortical integument. In the course of their downward descent the woody bundles gradually separate into threads, till at last the vascular system, which for a long time formed an essential part of each of them, disappears, and there is nothing left but woody tissue. In this view of the growth of *endogens*, the trunk of such plants must consist of a series of arcs directed from above inwards, and then from within outwards; and consequently the woody fibres of such plants, instead of being parallel with each other, must be interlaced in infinite intermixture. There are, however, some difficulties in the way of this theory, which we do not find adverted to by its author. If Mohl's view of the structure of *endogens* be correct, they must after a time lose the power of growing, in consequence of the whole of the lower part of their stems being choked up by the multitude of descending woody bundles. Is this the case? The lower part of their bark, too, must be much harder, that is, much more filled with woody bundles than the upper. Is that the fact? The hardness of the exterior of palm-stems cannot be owing to the pressure of new matter from within outwards, but to some cause analogous to the formation of heart-wood in exogens. Is there any proof that such a cause is in operation? I mention these things," continues Dr. Lindley, "not so much from distrust of Mohl's views, as from a desire to see the difficulties which seem to lie in the way of an ingenious theory satisfactorily removed."

At the time of reading this I was prosecuting my botanical researches on the Organ Mountains of Brazil; and having ample opportunity for making observations on the subject, from the great number of individuals of the palm tribe which are found on this range, of all sizes, from the tall species that inhabit the plains, to the dwarf ones which are met with at an elevation of upwards of 5000 feet, I determined to ascertain whether or not the views of Mohl, as stated by Dr. Lindley, were correct.

The first individual I examined was a large low-growing species, called by the Brazilians *Coqueiro*. The stem measured 4½ feet in circumference, and the leaves were inserted at the distance of 3 inches from each other. Having caused a longitudinal section of the stem to be made, both through the portion destitute of leaves, and that to which the leaves were attached, the bundles of woody fibre were distinctly seen passing from the scars and the bottoms of the leaves downwards and inwards to the middle of the stem at an angle of 18°. The individual fibres being large in this species, I was

able to trace their course with great ease. I found that after entering the stem they made a gentle curve downwards and inwards till they reached nearly the centre of the column; then, changing their direction, they turned downwards and outwards, with a greater degree of obliquity than before, till they reached within a little of the external surface of the stem, after which they continued to descend in a line parallel with its axis, ultimately becoming so much ramified that I was unable to trace them. The chord of the arc, or the distance from the place where the fibres entered the stem, to the point where they finished their curve, was $2\frac{1}{2}$ feet. I was not only able to trace the fibres as above described, but could also trace them from the interior of the stem for a considerable distance up into the substance of the leaf itself.

Longitudinal sections of the stems and leaves of the cabbage-palm (*Euterpe edulis*, Mart.), of a very tall species, called by the Brazilians *Patí*, and of a small one which they call *Oricana*, all exhibited precisely the same structure, the length of the curve of the fibres only differing according to the thickness of the stems of the different individuals and the distance between the insertion of the leaves.

The stems of all the species split with difficulty, owing to the great mesh-work of interlaced fibres.

Having thus shown that the views of Mohl regarding the origin and direction of the woody fibre of the stems of palms are quite in accordance with what I have myself observed, I shall now make a few remarks on the objections, or rather doubts, which Dr. Lindley has expressed concerning them. In the first place, he says, "if Mohl's view of the structure of *endogens* be correct, they must after a time lose the power of growing in consequence of the whole of the lower part of their stems being choked up by the multitude of descending woody bundles. Is this the case?" In none of the oldest palm-trees which I have seen cut down did it seem that this would ever be the case, the stem always exhibiting a like thickness of external hard, and internal soft portions, from the root to a height of many feet; and that this ought to be the case, is obvious from their structure. As the bundles of woody fibre originate from the leaves, and as they are placed the one above the other on the stem, it follows that the fibres of the upper leaves will not descend so far as those of the lower, and that, consequently, as the stem increases in height so will the density of its sides increase upwards also. In the second place, he says, "the lower part of their bark, too, must be much harder, that is, much more filled with woody bundles than the upper. Is that the fact?" Every one who has been in the

habit of seeing old palms cut down knows this to be the fact. When the axe is laid to the bottom of some of these old stems, it rebounds from them as if it were striking a piece of iron, while the upper part can be cut through with the greatest facility. Every Brazilian is aware of this fact. So durable is the wood of the large species of palm which they call *Pati*, that they prefer it to most other wood for supports to their houses, which in the country are generally built of wood, but it is only the lower, never the upper portion of the stem that they choose. The explanation given above will also account for this fact. In the third place, he says, "The hardness of the exterior of palm-stems cannot be owing to the pressure of new matter from within outwards, but to some cause analogous to the formation of heart-wood in *exogens*. Is there any proof that such a cause is in operation?" Before replying to this, I may observe, that the opinions of vegetable physiologists are still unsettled regarding the formation of wood in exogenous stems; Lindley, and others, maintaining the opinion of Du Petit Thouars, that the wood of a plant is formed by the multitude of leaf-buds by which it is covered, each of which may be considered a fixed embryo, having an independent life and action—that by its elongation upwards it forms new branches, and by its elongation downwards it forms wood and bark;—whilst DeCandolle, and most of the French physiologists, explain its formation by the hypothesis, that new layers are developed by pre-existing layers, which are nourished by the descending juices formed in the leaves. In palms, a longitudinal section of their stems, with the leaves still attached to them, only requires to be seen to convince the most sceptical that the ligneous substance of them is formed by the leaves, and this affords another proof, at least an analogical one, to the many which have already been given, that the wood of *exogens* originates in the leaves. The only difference between the formation of these two kinds of stems seems to be, that in the exogenous tribes the woody fibre always remains between the bark and the last-formed layer of wood; while in the stems of palms the bundles of woody tissue pass downwards and *inwards* to the interior of the stem, then gradually downwards and *outwards*, and finally descend parallel with the axis of the stem, through the previously formed tissue of the same nature.

Organ Mountains, Brazil, May 28, 1837.

XII.—Excerpta Botanica, *or abridged Extracts translated from the Foreign Journals, illustrative of, or connected with, the Botany of Great Britain.* By W. A. Leighton, Esq., B.A., F.B.S.E., &c.

No. 2. *On the mode of Growth of the* Ophioglosseæ. By Alex. Braun. (Ann. des Sc. Nat. n. s. xiii. p. 63.)

The cellular body from which, in the genus *Ophioglossum*, the leaves arise, is not a sheathing leaf, nor of the nature of a stipule or a ligule; but is, in reality, a cellular body enveloping the centre of development, on the *exterior* of which centre the leaves are arranged in a regular spiral order, and in which situation they continue until their expansion, which, in *Ophioglossum vulgatum*, takes place in the fourth year. In this body each leaf occupies its own particular cellule, which, enlarging with the growth of the leaf, is in succession elevated into a conical form and becomes finally ruptured like a sheath. The spike in *Ophioglossum* is axillary, and is the solitary leaf of a bud developed in the axil of the sterile leaf, to the stalk of which that of the spike is agglutinated. In the genus *Botrychium*, at least in the advanced state in which alone it has been hitherto examined, this enveloping cellular body does not exist, but the leaves ensheath each other. M. Braun considers the cellular body in *Ophioglossum* as a thalloid formation remaining during the entire life of the plant, and correspondent to the cellular organ through which the primary leaves of germinating ferns penetrate, and to which the name of *proembryo* has been given. As in the Phanerogamæ the first commencement of a plant gives birth to a leaf developing itself in the interior of a cellular organ (the *sac embryonaire*), so it would appear that throughout the whole vegetable kingdom the formation of a thallus precedes the formation of leaves.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

December 4, 1839.—A paper was first read, entitled "A Description of the Soft Parts and of the shape of the Hind Fin of the Ichthyosaurus, as when recent," by Richard Owen, Esq., F.R.S., F.G.S.

The osseous frame-work of the fin of the Ichthyosaurus, Mr. Owen observes, having alone been the subject of direct examination, the exact shape and the nature of the soft parts had been matters of conjecture. A very striking deviation from the reptilian and mammalian types had, indeed, been recognised, and resemblance also to

the fins of fishes had been admitted in the digits of the fin exceeding five, in their being sometimes bifurcated, and in consisting of an extraordinary number of ossicles; yet owing to the form of the digital ossicles, their breadth and flatness, and their large size, as compared with the joints of the fin-rays of fishes, it had been generally supposed that the locomotive organs of the Ichthyosaurus were enveloped, while living, in a smooth integument, which, like that of the turtle and porpoise, had no other support than was afforded by the bones and ligaments within.

Sir Philip Grey Egerton in a recent examination of Ichthyosaurian remains in the possession of Mr. Lee of Barrow-on-Soar, detected, with the penetration which has enabled him to bring to light many other obscure points in the structure of the Ichthyosaurus, traces of the soft parts of the fin in a slab of lias containing a mutilated paddle; and having submitted the specimen to the examination of Mr. Owen, a detailed account of its character forms the subject of this memoir.

Mr. Owen considers the specimen to be the posterior fin of the *Ichthyosaurus communis*. It presents impressions and mutilated portions of six digits, with the impression,—and a thin most distinctly preserved—of the dark carbonized integument of the terminal half of the fin, the contour of which is thus most beautifully defined.

The anterior margin is formed by a smooth unbroken well-marked line, apparently a duplication of the integument: but the whole of the posterior margin exhibits the remains and impressions of a series of rays by which the fold of the integument was supported. Immediately posterior to the digital ossicles, is a band of carbonaceous matter of a distinctly fibrous structure, varying from two to four lines in breadth, and extending in an obtusely-pointed form for an inch and a half beyond the digital ossicles. This band Mr. Owen believes to be the remains of the dense ligamentous matter which immediately invested the bones of the paddle, and connected them with the enveloping skin. The rays, above-mentioned, are continued from the posterior edge of this carbonized ligamentous matter, in which their bases appear to have been implanted, to the edge of the tegumentary impression; the upper rays being directed transversely, but the others gradually lying more in the direction of the axis of the fin, as they approach its termination. The most interesting feature in these rays, Mr. Owen says, is their bifurcating as they approach the edge of the fin.

From the rarity of their preservation, their appearance and coexistence in the present instance with remains of the integument, he states, it is evident they were not osseous, but probably either cartilaginous, or of that albuminous horn-like tissue, of which the marginal rays consist in the fins of the sharks and other plagiostomous fishes. Besides the impression of the posterior marginal rays, the specimen presents a series of fine, raised, transverse lines, which cross the whole fin, and probably indicate a division of the rigid integument into scutiform compartments, analogous to those

on the paddle of the Turtle and webbed foot of the Crocodile; but they differ in the absence of subdivision by secondary longitudinal impressions. The structure of the integument of the fin agrees, therefore, with the known reptilian characters of the skeleton of the Ichthyosaurus; and, as the skin with its appendages gives a character to the great primary groups of vertebrata, it might be expected that the skin of the Ichthyosaurus would exhibit some of the characters of the integument of existing reptiles.

In conclusion, Mr. Owen remarks, that the other new facts presented by the specimen, accord with the indications of the natural affinities of the Ichthyosauri afforded by their less perishable remains; and that all the deviations from the reptilian structure of the skeleton tend to the type of fishes and not to that of cetaceous remains.

Dec. 18, 1839.—A paper was first read, entitled "Description of the fossil remains of a mammal, a bird, and a serpent, from the London clay," by Richard Owen, Esq., F.R.S., F.G.S.

The author commences by observing, that only a few months had elapsed since the highest organic animal remains known to exist in the London clay were those of reptiles and fishes; and that the danger of founding conclusions in Palæontology from negative evidence was perhaps never more strikingly illustrated than by the fact, that the first scientifically determined relic of a warm-blooded animal from that formation proved to belong to the highest order of that class, if man be excepted; and that besides those quadrumanous remains, there have since been discovered in the London clay underlying the coralline crag, near Kyson, in Suffolk, teeth of cheiroptera, and of a species probably belonging to the marsupial order*.

Mr. Owen then proceeds to describe the fossils, the immediate objects of the communication.

1. The portion of the mammal was discovered by Mr. Richardson in the cliffs of Studd Hill, near Herne Bay, and belongs to a new and extinct genus of Pachydermata. It consists of a small mutilated cranium about the size of that of a hare, containing the molar teeth of the upper jaw nearly perfect, and the sockets of the canines. The molars are seven in number on each side, and resemble more nearly those of the Chæropotamus than of any other known genus of existing or extinct mammalia. They present three distinct modifications of the grinding surface, and increase in complexity from before backwards. The first and second spurious molars have simple sub-compressed crowns, surmounted by a single median conical cusp, with a small anteric. and posterior tubercle at the outer side, and a ridge along the inner side of its base. They are separated by an interspace nearly equal to the antero-posterior diameter of the first molar. The second and remaining molars are in close juxtaposition. The third and fourth molars form the principal difference between the dentition of the present genus and that of the Chæropotamus, being larger and more complex in the grinding surface. They

* See Annals of Nat. Hist. vol. iv. p. 189.

present a sudden increase in size and change of form. The plane of the crown is triangular, with the base outwards, and the posterior and inner side convex: it supports three principal cusps, two on the outer, and one on the inner side; there are also two smaller elevations with a depression on the summit of each, situated in the middle of the crown, and the whole is surrounded with a ridge which is developed into a small cusp at the anterior and external angle of the tooth. The three true molars closely correspond with those of the Chæropotamus. The sockets of the canines indicate that these teeth were relatively as large as in the peccari.

The bones of the head are separately described: the palatal processes of the maxillary bones are shown to be rugous, as in the peccari; the eye to have been full and large, as indicated by the size of the optic foramen and the capacity of the orbit, equalling an inch in vertical diameter: the general form of the skull is described as partaking of a character intermediate between that of the hog and the hyrax, though the large size of the eye must have given to the physiognomy of the living animal a resemblance to that of the Rodentia.

These indications, Mr. Owen says, scanty though they be, of the form of a species nearly allied to the Chæropotamus, are extremely interesting, on account of the absence of similar information regarding that genus. The resemblance of the molar division of the dental system in the new genus, for which the name of Hyracotherium is proposed, and the Chæropotamus, is sufficiently close to warrant the conclusion, that the canines and incisors if not similar would differ only in form and proportion; and that hence it may be ventured to solve analogically some of the doubts entertained by Cuvier respecting the dental characters of the Chæropotamus, and to affirm confidently that it had canines in the upper as well as the lower jaw. The incisor teeth with the ossa intermaxillaria are wanting in the specimen of the Hyracotherium, and have not been found in any fragment of the Chæropotamus.

2. The remains of birds described in the paper consist of a sternum, with other bones, and a sacrum, the former belonging to the collection of the late John Hunter, in the Royal College of Surgeons, and the latter to the cabinet of Mr. Bowerbank. Both the specimens were obtained from Sheppey. The Hunterian fossil includes the sternum nearly entire, the proximal ends of the coracoid bones, a dorsal vertebra, the distal end of the left femur, the proximal end of the corresponding tibia, and a few fragments of ribs. Mr. Owen first shows, in approximating to which of the three great groups of birds, terrestrial, aërial, or aquatic, the Ornitholite belonged, that from the length of the sternum and the remains of the primary intermuscular crest or keel, it could not have been a strictly terrestrial bird, though these characters do not prove that it was a bird of flight, as they occur in the Penguins or other Brachyptera, which have need of muscular forces to work their wings as paddles under water. In the present fossil, however, from the lateral extent and convexity of the sternal plate, the presence and course of

the secondary intermuscular ridges, the commencement of the keel a little way behind the anterior margin of the sternum, Mr. Owen says there is no affinity with the brachypterous family. The coracoid bones or posterior clavicles, he also shows are less available in determining the habits of the Ornitholite, as they relate much more closely to the respiratory actions than to the movements of the wings, and are strongly developed even in the Apteryx. There remained consequently for comparison the ordinary birds of flight; and of these, the native species, which resemble the fossil in size, first claimed Mr. Owen's attention. Though the sternum is not complete, yet sufficient remains to have enabled him to set aside the Gallinaceous, and those Grallatorial and Passerine birds which have deeply incised sternums, and to restrict the field of comparison to such species as have the sternum either entire, or with shallow posterior emarginations. After a rigid comparison of the minor structural details and pursuing it from the sea gulls and other aquatic birds upwards through the Grallatorial and Passerine orders, omitting few British species, and no genus, he at length found the greatest number of correspondences in the skeleton of the accipitrine species. The resemblance, however, was not sufficiently close to admit of the fossil being referred to any native genus of Raptores: the breadth of the proximal end of the coracoid removes it from the owls (*Strigidæ*), the shaft of the same bone is too slender for the Falconidæ; and the femur and tibia are relatively weaker than in many of the British Hawks or Buzzards. It is with the Vultures that Mr. Owen has found the closest agreement; but he says the fossil indicates a smaller species than any known to exist in the present day, and is probably a distinct subgenus.

The professed ornithologist Mr. Owen remarks, may receive with reasonable hesitation a determination of family affinities arrived at, in the absence of the usual characters deduced from the beak and feet; but in the course of a long series of close comparisons, he says, he has met with so many more characters, both appreciable and available in the present problem, than he anticipated, that he confidently expects, in the event of the mandibles, the bones of the feet, or the entire sternum of the bird in question being found, they will establish his present conclusion, that the Sheppey ornitholite is referrible to a member of the group of Accipitrine Scavengers, so abundant in the warmer latitudes of the present world.

The Ornitholite in Mr. Bowerbank's museum consists of ten sacral vertebræ anchylosed together, as is usual in birds with a continuous keel-like spinal ridge. Four of the vertebræ are analogous to the lumbar vertebræ in the mammalia, and they are succeeded by five others, in which, as in the Vultures, the inferior transverse processes are not developed. This character, however, Mr. Owen says, is not peculiar to the Vulturidæ. Though the part of the fossil preserved is eminently characteristic of the class of birds, yet it is not calculated to throw light on the closer affinities of the species to which it belongs: nevertheless it supports rather than affects the determination of the Hunterian specimen. For the apparently ex-

tinct bird indicated by these fossils, the name of *Lithornis vulturinus* is provisionally proposed.

3. Mr. Owen commences his description of the remains of an extinct species of Serpent found at Sheppey, by pointing out the essential characters by which the vertebræ of an Ophidian Reptile are distinguished.

Vertebræ joined enarthrodially by a deep anterior transversely oblong cup and a corresponding prominent posterior ball, and further articulated by projecting posterior oblique processes, wedged like the carpenter's tenon into a mortice, excavated in the anterior oblique processes of the succeeding vertebra, supporting moreover on each side of the fore part of the body an oblong convexity for the moveable articulation of the rib, can belong, Mr. Owen observes, to no other than a reptile of the Ophidian order.

One of the specimens described in this portion of the memoir, consists of about 30 vertebræ possessing the above characters; also of a number of long slender ribs, having expanded concave vertebral extremities cemented irregularly together by a mass of indurated clay, and it forms part of the Hunterian collection of fossils; another specimen, consisting of 28 vertebræ, and some others of less magnitude, belong to Mr. Bowerbank's collection. All the specimens, Mr. Owen considers, are referrible to the same species, and they were all found at Sheppey.

The vertebræ in each specimen present the same conformation, and nearly the same size, being equal in this respect to those of a Boa Constrictor 10 feet long. They belong to the ordinary dorsal or costal series, and differ from those of the Boa and Python in their superior length as compared to their breadth and height. The ridge continued from the anterior to the posterior oblique processes on each side is less developed: the oblique processes themselves do not extend so far outwards; and the spinous process is narrower in its antero-posterior extent but longer. In the first two of these differences, the fossil agrees with the Linnæan Coluber and its subgenera, but differs from the Crotalus; and in the remaining points it differs from Crotalus, Coluber, Naja and Trigonocephalus. The long and comparatively narrow spine, the outward prolongation of the upper angle of the posterior oblique processes, the uniform convexity of the costal protuberance, the uneven or finely wrinkled external surface of the superior arch of the vertebra, are characters which distinguish these Ophidian vertebræ from those of any other genus of the order with which Mr. Owen has been able to compare them. He therefore proposes to call the species provisionally *Palæophis Toliapicus*.

The ribs are hollow as in all land serpents.

From the agreement in the configuration of the under surface of the body of the vertebræ of the fossil with that in the vertebræ of the Boæ and Pythons more nearly than with the Colubri, and in none of the differences above noticed indicating any obstacle to the entrapping and destroying a living struggling prey, as well as from the length (11 feet) which it may be inferred the creature attained,

Mr. Owen concludes it was not provided with poisonous fangs. Serpents of similar dimensions exist in the present day only in tropical regions, and their food consists principally of the warm-blooded animals. Mr. Owen therefore in conclusion states, that had no evidence been obtained of birds or mammals in the London clay, he would have felt persuaded that they must have coexisted with the *Palæophis Toliapicus*.

ZOOLOGICAL SOCIETY.

December 10, 1839.—William H. Lloyd, Esq., in the Chair.

A letter from Dr. Weissenborn, dated Weimar, October 6, 1839, was read. It accompanied a present of two specimens (male and female) of the black variety of the common Hamster (*Cricetus vulgaris*), and a head, preserved so as to display the cheek-pouches of that animal. The writer of the letter states that he possesses a common Pigeon, just fledged, in which no vestiges of the organs of vision can be traced. "The orbits are tolerably well developed, and lined with a sort of half-mucous membrane, and therefore destitute of feathers. I have never heard of a similar defect in any animal; and in one where the incubation is extra-uterine it appears doubly wonderful or anomalous. The bird is quite healthy, and presents in its habits several curious anomalies, which may be traced to its monstrosity."

Professor Owen communicated his notes on the Anatomy of the Biscacha (*Lagostomus trichodactylus*, Brookes).

"The individual dissected," says Mr. Owen, "was a female, full-grown, weighing 8 pounds 2 ounces, avoirdupois: the weight of the brain was 5 drachms, avoirdupois, the proportion of the brain to the body being as 1 to 416. This is the smallest relative size of the brain that has yet been recorded in the Rodent order, in some of the species of which order, as the Mouse, the brain approaches that of Man, the relation of its mass to that of the body being as 1 to 46; that of the human subject is as 1 to 30. The brain presented the usual broad depressed form and simple unconvoluted surface characteristic of the Rodent order: its length was 1 inch 8 lines, its breadth 1 inch 5 lines, and the length of the cerebral portion 1 inch 3 lines. The proportion of the cerebellum to the cerebrum was as 1 to 5. The breadth of the *medulla oblongata* was to that of the *cerebrum* as 1 to 6. The upper surface of each lobe of the cerebrum is marked with two slightly curved fissures, each between 3 and 4 lines in length, and one a little in advance of, and exterior to the other: a single anfractuosity defines the external convex prominence of the cerebrum. On the under surface a fissure is continued from the posterior part of the cerebral hemisphere forwards, along the middle of the natiform protuberance, to the outer boundary of the root of the large olfactory nerve.

"On laying open the abdomen an immense accumulation of adipose membrane concealed the viscera; the bag of the great omentum

formed, however, a small part of this covering, as after extending down over half the abdomen it was reflected upwards, in front of the liver. The lower half of the abdominal cavity was overlapped by broad and thick adipose processes, continued from the lower convolutions of the colon, without being connected with the great omentum, and from the fundus of the urinary bladder. The *appendices epiploicæ* of the human colon may be regarded as rudimentary conditions of the adipose folds here so enormously developed. The stomach corresponded in form and relative size with that of the *Chinchilla* (see Trans. Zool. Soc., vol. i. p. 51. pl. V.). The left blind extremity projected about an inch beyond the cardia; the pyloric end became suddenly contracted: the cuticular lining of the œsophagus terminated at the cardia in five pointed processes, radiating from the cardia.

"The duodenum was dilated, as in many other phytophagous Rodents, at its commencement; it descends with a slight sigmoid flexure to the right lumbar region, then crosses over to the left side, being freely suspended in a broad duodenal mesentery, which contracts as the gut perforates the base of the meso-colon to become the jejunum. The small intestines presented the usual disposition: the cæcum is of moderate length, viz. four inches, with a diameter of two and a half inches, thus corresponding in general form with that of the *Chinchilla*. The colon first crosses obliquely the lower part of the abdomen, and returns, forming a fold of about four inches in extent; it then describes a second much larger and narrower fold, of ten inches in length: it is at the bend of this fold that the fæces begin to be separated into pellets, and it is from these loops that the omental processes are continued: the colon then bends over the root of the mesentery, passing below the stomach to the left side of the abdomen, where it describes a series of convolutions before ending in the rectum. No omental process is continued from these folds, but the meso-colon, to which they are suspended, is of great breadth, and was loaded with fat.

	Feet.	Inches.
Length of the small intestines	14	9
——————— large ditto	7	5

"The anal, vaginal, and urethral outlets are separate from one another.

"The liver consists of a left lobe, a cystic lobe, and two small right lobes, with a spigelian appendage. The cystic lobe is fissured, and the left division is perforated on its free convex surface to receive a process of the suspensory ligament.

"The gall-bladder was of very small size.

"The spleen is triangular, with the upper or anterior angle most produced.

"The kidneys and suprarenal glands as usual in Rodents. The heart presented the usual form; two superior venæ cavæ, the left joining the inferior cava, and receiving the coronary vein. The

right lung presented three lobes and the median lobule; the left lung three lobes.

"There was nothing remarkable in the ovaria or fallopian tubes. The two uteri terminate by distinct valvular orifices; they are long and narrow: in each mesometry there is a plexus of transversely disposed vessels, principally veins, which runs parallel with the uterus, and seems to represent the remains of the wolffian body. The most interesting feature in the generative organs was a longitudinal septum, dividing the vagina into two canals for upwards of an inch beyond the *ora tincæ*. This septum terminated by a thin concave edge, directed towards the outlet of the vagina. There was no constriction or valvular fold between the divided and the undivided portions of the vagina; the former were somewhat more vascular, and slightly plaited longitudinally. The whole length of the vagina was four inches. The clitoris was perforated by the urethral canal, and was nine lines in length.

"No other placental quadruped has hitherto presented so near an approach to the marsupial type of the female organs as the *Lagostomus*. Rudiments of a vaginal septum occur in the young or virgin state of several genera; but it is only in the *Lagostomus* that a continuation of the median separation of the genital tubes has been continued beyond the uterine portion along so great an extent of the vagina, and as a permanent structure."

Professor Owen also communicated the following paper, entitled "Observations on the Generative System of some of the lower Animals," by Professor Rudolph Wagner, M.D.

"Among a variety of observations which I undertook on the coast of Nice in August and September 1839, for the purpose of obtaining a more intimate knowledge of the anatomy and physiology of marine animals, there are several which perhaps afford some more general interest for the natural history of animals.

"Many of my own earlier observations had produced the conviction, that a disjunction of the sexes is much more universal than has been hitherto admitted. Cuvier, in his 'Règne Animal,' and after him the most of those who have entered upon Zoological Classification, still assume that among the so-called lower animals many are no more than females, and others without sex.

"Thus, to begin with the *Mollusca*, and judging from assertion, the *Cyclobranchiata* up to the present time are known only as females. I succeeded as well in *Patella* as in *Chiton* in finding some individuals that were males, and others that were females. The males have a white testis, with active spermatozoa, resembling those of muscles; the females have all the elements of the primitive ovum. The *Ascidiæ* also appear to be of disjoined sex. I found, however, in several species merely ova, but ova that presented the germinal vesicle and germinal spot.

"Among the *Radiata* I had hitherto found only females, as well in the Starfish as in the Sea-urchin and the *Holothuriæ*. The pear-

shaped vesicles which open into the efferent duct of the ovary in *Holothuria tubulosa*, and which Delle Chiaje regards as testes, positively showed no spermatozoa in three individuals, in which the pale rose-red ovary was otherwise much developed, and presented the most beautiful ova, with germinal vesicle and germinal spot. But in the first individual which my friend Professor Valentin opened, the organ corresponding and very similar to the ovary immediately presented a difference (from the ovary) in its white contents. We also saw indeed in those contents the most beautiful spermatozoa, much resembling those of osseous fishes. Numerous other individuals constantly presented themselves, either as males or females.

"Regarding the *Medusæ*, Von Siebold of Dantzic had already mentioned that he had found male individuals with spermatozoa in *Medusa aurita*. In Nice I convinced myself with the greatest certainty in *Pelagia*, *Aurelia*, *Cassiopeia*, and a fourth genus, that these *Medusidæ* are always of disjoined sex. The males, with their spermatozoa actively moving (even within the capsules of the testes), are at the first glance to be distinguished from the females, whose ovaria always contain ova in different stages of development*.

"It is of especial interest to find that a disjunction of sex admits of demonstration, even in the *Polyps*. One of my companions, Dr. Erdl, (?) of Munich, found in *Veretillum* only female individuals in one *Polypary*, and in others only males. He writes me that he has afresh convinced himself of the same relation in *Alcyonium*, though the specimen had been preserved in spirit; and that among the *Mollusca* he has found similar sexual differences in *Haliotis*; thus in the *Aspidobranchia* of Cuvier.

"I must here remark, that my earlier statements on the spermatozoa of the *Actiniæ* are erroneous, since I regarded entirely peculiar and remarkable capsules with long threads (situated even on the prehensile arms) as spermatozoa.

"My researches on the spermatozoa of cartilaginous fishes have shown the remarkable fact that the individual genera of the Rays and Sharks are distinguishable by the form of their spermatozoa. These spermatozoa are for the most part spirally wound, as in birds of song. Very remarkable is the structure of the testis; which is constantly connected with a largely developed and winding *vas deferens*. That which Johann Müller has described in the Rays as a peculiar gland is nothing else than this *vas deferens*. The relations in form of the male genital organs alternate much, as I shall show in a special and more comprehensive work.

"The facts here reported were not witnessed by myself alone, but also by Professor Valentin of Bern, Dr. Peters of Berlin, and five young zootomists, pupils of mine, who were all in Nice at the same time as myself, and took a part in my observations."

* I shall state these sexual relations in a special and detailed work on the whole anatomy and physiology of the *Medusæ*.

MISCELLANEOUS.

ON A WHITE VARIETY OF THE HYACINTH AND COLUMBINE.

Pontypool, July 16, 1810.

Sir,—I have to apologize for having so long delayed the remainder of my communication upon spontaneous generation, but having been rather fully engaged since the first part of it was inserted, I have not been able to transcribe it: I hope to be able to send it in about a week or ten days, so that I am afraid it will be too late for the next Number.

In addition to the white varieties of plants mentioned by Mr. Adams in the last Number, I have observed in this neighbourhood white varieties of the common Hyacinth and Columbine (*Aquilegia*): the whole plant of the latter varies very much in colour from the proper plant, being wholly of a light green, and possessing none of the purplish-brown shade on the stems, so conspicuous in its normal state, so that they may easily be known when not in flower. I have seen large bushes of it growing within a few yards of the other variety.

I remain, yours most respectfully,

James Bladon.

P.S. The species of Crane Fly alluded to is a species of *Trichocera*, according to Mr. Westwood, from whom I have received a letter to that effect; he has also mentioned it in his "Introduction."

ON A SPECIES OF BALÆNOPTERA STRANDED ON CHARMOUTH BEACH.

Charmouth, Dorset, 9th July, 1810.

Sir,—My communication to Mr. Charlesworth respecting a species of Balænoptera stranded on Charmouth beach, which appears in your Magazine of Natural History of the 1st of July, should have been corrected by my second letter to him on the same subject previously to its being published. In my second communication I requested that the paragraph stating "that two small bones representing the pelvis in quadrupeds were attached (one on each side) to the first caudal vertebra," should be omitted, *as no such bones exist*; my second letter also contained several particulars respecting the sternum, os hyoides, bones of the spine, &c., which should have been incorporated with the first account, as it would have rendered it more complete and correct.

I gave as my chief reason for believing "that our species differed from those previously described," the circumstance of its possessing only *sixty vertebræ*, the others having sixty-two; a more particular and careful investigation has convinced me that *two* of the small caudal bones have been lost, making the whole number sixty-two, and I am now convinced that it is nothing more or less than a small specimen of the species stranded at Ostend some years ago, and exhibited in London, viz. the Rorqual "Balænoptera boops."

Yours, &c.,

R. H. Sweeting, Surgeon.

ON HYBRID PHEASANTS.

Farnham, July 11th.

Dear Sir,—I have lately mounted a brace of hybrid Pheasants, and have been requested to forward a memorandum to you; if it is any way interesting, you are welcome to make use of it. I believe there is not an instance mentioned as having occurred in a wild state, at least I have been so informed.

The keeper of Henry Halsey, Esq., of Henley Park, two years ago hatched a hen Golden Pheasant with a brood of common Pheasants, and allowed her to take to the woods with the others; the result has been two beautiful hybrids, with the characters of the two species so beautifully combined, that the most casual observer would not fail to perceive it at first sight: they have not the bright markings of the common Pheasant, nor the gorgeous colours of the Golden Pheasant; but they present the more sombre tints of the two.

They were shot by Henry Halsey, Esq. at the latter end of January, and are now in his possession.

Yours respectfully,
James Lowcock.

ON A SPECIMEN OF THE SHEARWATER PETREL, KITE, &c.

Chipping Norton, Oxon, July 9th, 1840.

Sir,—A fine specimen of the Roller (*Coracias Garrula*) has lately come under my notice, which was shot in the end of June, 1839, by the gamekeeper, on the Guiting estate, Gloucestershire; and in September last a specimen of the Shearwater Petrel (*Puffinus Anglorum*) was taken within this parish. The bird rose from the ground, but being unable to fly far, was soon captured and brought to me alive; I endeavoured to feed it, but after nearly two days, during which it appeared to have taken no food, I killed and stuffed it. The bird made good use of its bill and wings in self defence, making at the same time a loud breathing or hissing noise.

The Kite (*Milvus regalis*) is become a rare bird. I have recently obtained a specimen shot on December 29, 1838, about eight miles from hence, in the vicinity of Stow. The bird had frequented the neighbourhood several days, and shots were fired at it, but to no purpose, till at last it was seen by a boy to fly into a plantation at the bottom of Stow Hill; he hastened up to the town and informed the parties who had previously been in pursuit, and on their arrival at the place it was shot whilst perched at roost.

The third volume of Mr. Macgillivray's 'History of British Birds' has just reached me; it is a most excellent work, and I would recommend every ornithological student to procure a copy. There are other prettily and beautifully illustrated works, but this, in my opinion, for the accuracy and minuteness of its detailed descriptions, is scarcely to be excelled; the "Lessons," too, of this practical ornithologist, together with the author's account of his rambles "o'er moor and mountain," in company and alone, with other valuable

features, are highly entertaining and instructive. I sincerely hope the publishers will let us have the remaining portion of the work—the Water birds—with as little delay as possible, for the author's valuable experience with this tribe, advantageously located as he is, must prove exceedingly useful.

Wild Geese (I cannot say what species) were seen in this neighbourhood on June 16; thirteen appeared in the flight. This appears unusually early, supposing them to be a brood of the present year.

THOMAS GOATLEY.

NOTES ON BRITISH BIRDS.

To the Editors of the Annals and Magazine of Natural History.

The GOSHAWK.—Of this handsome bird I kept three specimens in the year 1837: two were females, and at least one-third larger and stronger than the male. The young Hawk for some time after birth is covered with a thick white down in place of feathers, and, upon the whole, much resembles a young Turkey. Until four or five months old it does not stand erect, but holds the head low, rounding the back like a Guinea-fowl. The cry, which is easily excited, resembles a quick shrill repetition of the letter P, pe-pe-pe-pe-pe. Whilst the bird is young its fæces are ejected with surprising force, even to the distance of eight or nine feet.

When a bird was placed near the bars of the cage in which they were confined, one of the Hawks would rush up to it, and dashing into it a claw, drag it to one corner of the cage, extending his wings round it to prevent the approach of the others. This, however, was somewhat difficult; and often, when the devourer least expected it, his *bonne bouche* was snatched from him by another, who had perhaps relinquished his own piece for the purpose. Howbeit the loser never appeared incensed at the theft.

When presented with a living bird, the Hawk invariably seizes it round the neck with his talons, and begins devouring the head, regardless of the cries and struggles of its victim. The pressure on the neck and blows on the skull quickly cause death, and the Hawk begins feeding with such hearty good will, that in a few minutes nothing remains but a few feathers.

FRAGILITAS OSSIUM (?) in the KESTREL.—In the year 1837 I purchased a young Kestrel of a boy from Wilcot. I was at the time surprised at the peculiarity of its shape, and the difficulty it experienced in walking. Its appetite was voracious, and it was exceedingly tame. When fully fledged, it was suddenly seized with violent spasms; the leg being thrown over the back, and the wings drawn forwards over the breast. It appeared in great pain, but was very hungry. It continued in this state two days, when I killed it.

On examining the body I found nearly every bone dislocated or fractured, and rather softer than usual, containing less earthy matter. One femur had been broken in *five* places, the tibia in *four*; indeed, there were upwards of twenty recent or partially united

fractures in the long bones; the legs were greatly distorted and the spine crooked.

I am unable to account for the origin of the disease in this bird; it had been reared with several other young Hawks, and had lived chiefly on young unfledged birds, mice, &c. &c.

The KINGFISHER.—Of this beautiful, but stupid bird, I have had nine living specimens; seven young and two adult.

On April 14, 1837, a boy brought me a living female Kingfisher, which he had taken on the nest in the act of laying an egg, which I found on dissection covered with the shell and ready for expulsion. I immediately proceeded with him to the spot where the nest was found, for the purpose of examining its structure. It was formed in a hole about a foot in depth, which had been excavated in a bank overhanging a narrow brook. It was concealed from view by a tuft of long grass; but as the male bird was constantly sitting on a branch near the nest, the accumulation of fæces led to the discovery of the place of its concealment.

The nest itself was large and of peculiar structure, being composed exclusively of the exuviæ of the small fish it had devoured, mixed with fins, scales, &c., and the skins and legs of a little insect somewhat resembling a shrimp, which adheres to stones, &c. in running water.

Of this substance there was about sufficient to fill a pint cup. I preserved it, and posses some at the present time. The interior cavity is small: the eggs, of which I have four, are white, round, of moderate size, and six or seven in number.

In the spring of 1837, a boy brought me four young Kingfishers, half-fledged, which he had just taken from a nest near the same spot. I kept them two months, feeding them exclusively on fish, and washing them in lukewarm water daily. Under this treatment they thrived in a remarkable manner, and the plumage became as clear and brilliant as in a state of nature. They were indeed generally admired, but I was at length compelled to give them away on account of the great care and time I was obliged to devote to them.

The young Kingfisher is a very stupid and inactive bird. It will stand in the same posture one or two hours without moving a muscle, and its enjoyments seem concentrated in the narrow circle of eating and sleeping. On touching the extremity of the bill it opens its mouth, and after swallowing the morsel gravely closes it again, and looks round with laughable slowness for a second mouthful. It will swallow without inconvenience a minnow or loach half its own weight, and in the course of the day will devour ten or twelve such. It is very tame, readily standing on the finger to be fed. It casts up the bones and fins of the fishes in the form of a pellet like the Owl and Hawk, and of these pellets its nest is formed. The adult Kingfisher is very intractable, and refuses to eat when in captivity. On the whole, the Kingfisher is only tolerable on account of the beauty of its plumage.

CHARLES COWARD.

Devizes, July 8, 1840.

ON THE DISCOVERY OF *HYPERICUM LINEARIFOLIUM* IN ENGLAND.

Hypericum linearifolium was found by the Rev. Thomas Hincks of Cork, among granite rocks near the banks of the Teign, Devon, in the summer of 1838. Specimens are in his own collection and in that of the Rev. William Hincks, F.L.S. of London, who lately ascertained the species in looking over that part of his herbarium.

The same plant is amongst Mr. Babington's acquisitions in Jersey (see Annals, vol. ii. p. 348.), but it is interesting to know that it is also found in England, and it is somewhat curious that so conspicuous a plant has been so long overlooked.

TEMPERATURE OF VEGETABLES.

I have to thank M. Van Beck for the eagerness with which he has repeated my experiments on the peculiar heat of vegetables. His verification of the existence of this heat and of its diurnal period places these facts in the number of those which may take a definitive place in science, which, generally speaking, admits only that which has been seen by more than one observer.

M. Van Beck differs from me relative to a single fact of very little importance. I mentioned, that upon placing in the open air as a comparative experiment, part of a living vegetable and a similar part dead, the latter always appeared colder than the former; M. Van Beck constantly obtained an opposite result. This opposition in the results of our observations is perhaps caused by a difference in the mode in which our experiments were prepared. M. Van Beck plunged, as I did, the portion of vegetable which he meant to deprive of life into very hot water; perhaps he then let it grow cold in the open air, and thus lose by evaporation a part of the water which moistened its surface; whereas I cooled it by immersion in cold water, and it was thus completely soaked with water when I made the experiment.

It will be seen that there must be more evaporation from it than the less moist living vegetable portion, and that consequently, it would necessarily be colder, whilst an opposite result might be obtained when the vegetable portion, killed by the hot water, had been able to evaporate the excess of water, which it had gained by remaining some time in the open air. Perhaps, also, the peculiar nature of the vegetable parts may have an influence upon the difference of the results in question.—*Note of M. Dutrochet on M. Van Beck's observations on the Temperature of Plants, Comptes Rendus*, Jan. 13.

MICROGRAPHY—NEW OBSERVATIONS ON THE INFUSORIA OF ROCK SALT.

In the 'Comptes Rendus' mention is made of a note received by the Academy of Sciences from M. Marcel de Serres relative to the observations which he is making on this subject along with M. Joly.

In the specimens of rock salt of a tolerably decided greenish colour brought from Cardona (Spain), the infusoria appear more rare, smaller, and less distinct than in the specimens of a red colour before examined.

This, says M. Marcel de Serres, finds an explanation in M. Joly's

previous observations on the change of tint which the infusoria that colour our salt marshes undergo by age. These animalcules, which are white at their birth, become green in their middle age, and do not till their adult age take the purple tint which makes them so remarkable. In general the green infusoria are not so often seen as the red in salt marshes, which seems to indicate that these monads remain but a short time in their middle state.

We have found the same infusoria in the argilo-calcareous marls which are found at Cardona beneath the rock salt. There they have their beautiful purple tint, but they are in too small numbers to communicate it to the mass of marl which has remained grayish. This fact also proves, that in the ancient world, as in the present one, the animalcules were precipitated after their death to the bottom of the waters in which they previously lived.—*Comptes Rendus*, Mar. 16.

ON THE GENUS *PUPINA*. BY JOHN EDW. GRAY, ESQ.

The shell of this very curious and interesting genus has been placed by different authors in very different parts of the system, some persisting that it should be arranged with the marine genera on account of the grooves on the left side of the mouth. From a specimen which Mr. Powis has very kindly given to me, I have no doubt in my own mind that it is a very distinct genus of *Cyclostomidæ*, for this specimen has a horny orbicular many-whorled operculum as large as the mouth of the shell, exactly resembling the opercula of some of the genera of that family. The polished surface of the shell and the form of the notch is very unlike any that I have hitherto observed among the shells of marine mollusca. The latter is peculiar, as being funnel-shaped, wider outwards, and narrowed into a slit within, and only appears as a narrow simple groove on the outer surface of the peristome.

I am acquainted with two species of this genus; one *Pupina fusca*, small, pale brown, with a yellowish white peristome; and the other, *Pupina grandis*, twice the size of the former, more ventricose, and of a bright yelk yellow colour; there is a fine specimen of the latter species in the cabinet of Mr. Stainforth. I suspected that this genus should be referred to the family of *Cyclostomidæ* directly I had seen the animal and operculum of Mr. Guilding's genus *Megalomastoma*; but from the rarity of these shells, I had little hope of so soon being able to get the additional information furnished by the operculum, which was alone wanted to clear up the doubt. I have lately seen another shell which has the polished surface, mouth and operculum of this genus, but is destitute of the groove, and must form another genus of this family, for which I propose the name of *Callia*.—J. E. GRAY.

ON THE BYSSUS OF UNIO. BY JOHN G. ANTHONY, ESQ.—WITH NOTES, BY J. E. GRAY, ESQ.

"I have discovered another fact with regard to the *Unios* which has escaped the notice of other collectors thus far: in one locality near us (Cincinnati, U. S.), the *Unios* spin a byssus. The location

is a very peculiar one, a strong rapid current running over a gravelly bottom: in such exposed situation our *Unios* do not often attempt a lodgement, but prefer sandy bars or muddy shores where the water is not very deep or rapid. Upon these gravel beds, however, the *large shells* are imbedded, and the young ones spin the byssus by which they attach themselves to the larger shells or the stones of the gravel. In this way I have seen hundreds moored and riding securely at anchor at the utmost tension of their lines; for it is only, as far as I can perceive, a single filament. The thread appears to be attached to the mantle, and is probably produced by it, and is not an umbilical attachment. I saved some of the animals in spirits."—Letter, 16th May, 1840.

This account is curious in several particulars: first, as showing the relations of these animals to the family of *Arcadæ*; second, as showing what I have long expected from the observations I have made on some marine gasteropodous mollusca,—that many, if not most of the kinds, have the power of forming a byssus when it can assist them in their habits. It is very desirable, however, that the place where the byssus is attached to the animal should be re-examined, for if it takes its origin from the mantle, it is an anomaly in the organization of mollusca. It always arises, as far as I am aware, from some part of the foot, in general from the anterior part of the base, as in *Mytilus*, *Pinna*, *Avicula*, *Pecten*, &c., but sometimes from the end of this organ, as in *Arca*, from whence also, I should suspect, it most probably arises in the Unionæ.—J. E. Gray.

ON SOME RECENTLY PROPOSED GENERA OF THE *VIVERRIDÆ*.

To the Editors of the Annals and Magazine of Natural History.

Gentlemen,—You did me the honour of reprinting in your 'Annals of Natural History' for March, 1840, a short paper on the Crania and Dentition of the *Carnivora*, which I communicated to the Zoological Society. My object, as stated in that paper, was merely to point out a few simple characters by which the groups might be distinguished, the importance of those characters being confirmed by others exhibited, both by the internal anatomy and external structure of the species. Since the publication of that paper, M. Isidore Geoffroy* has furnished us with figures and descriptions of some interesting genera of *Carnivora* from Africa and Madagascar, which, according to my views, should be added to those already included in my list of the *Viverridæ*. They consist of the genera *Ichneumia*, *Galidia*, and *Galidictis*. The first of these (*Ichneumia*) belongs to that subdivision of the *Viverridæ* in which there is a complete bony orbit, and is founded upon three species described originally as species of the genus *Herpestes* or *Ichneumon*. The other two genera (*Galidia* and *Galidictis*†), in the straightness of the lower margin of the rami of

* See the '*Magazin de Zoologie*' of M. F. E. Guérin-Meneville, Parts 9 and 10 for 1839. An extract of this paper appeared in the '*Comtes Rendus*,' &c. for October, 1837.

† In the original paper *Galictis*. The alteration in the name was necessary, Mr. Bell having given the name *Galictis* to a group of the *Mustelidæ*.

the lower jaw, approach the Cats, and in my opinion should therefore be placed at the opposite extremity of the *Viverridæ*, the *Herpestes* group being apparently most nearly related to the Dogs. *Galidia* and *Galidictis* also approach the Cats in having the muzzle proportionately shorter than the other *Viverridæ*, and in having the true molars smaller. The genus *Galidia* appears to be scarcely sufficiently distinct from Mr. Bennett's genus *Cryptoprocta*.

In the Journal of the Asiatic Society of Bengal, No. 89, for May, 1839, Mr. Evans has published his Notes on the Anatomy of the *Arctonyx collaris*, which tend to show that this animal is closely allied to the Badger, and should occupy the situation in which I have placed it in my classification. *Arctonyx* and *Mydaus* I can but regard as subgenera of *Meles*.—G. R. Waterhouse.

Zoological Society, Aug. 27, 1840.

RETURN OF MR. GOULD.

We have much pleasure in announcing the safe arrival of our scientific friend Mr. Gould, the celebrated ornithologist, from Australia, after an absence of two years and a half, which he has devoted to the investigation of the habits and œconomy of the animals of that portion of the globe. His collections, we understand, are very extensive; and among other interesting materials brought home for the purpose of illustrating his work on the Birds of Australia, are the nests and eggs of a great portion of the species.

METEOROLOGICAL OBSERVATIONS FOR JULY, 1840.

Chiswick.—July 1. Overcast: boisterous. 2. Rain, with strong wind. 3. Cloudy and fine. 4. Very fine. 5. Cloudy: windy. 6, 7. Fine. 8. Fine: heavy rain. 9—12. Very fine. 13—17. Fine. 18. Overcast. 19. Cloudy: rain. 20. Heavy showers. 21. Very fine: rain. 22. Fine. 23. Cloudy. 24. Overcast and fine: rain. 25. Showery. 26. Cloudy: fine. 27. Fine. 28. Hazy. 29. Very fine. 30. Cloudy: rain. 31. Very fine.

Boston.—July 1, 2. Rain. 3. Stormy. 4. Fine: rain early A.M.: rain A.M. 5. Fine: rain A.M. 6. Cloudy: rain P.M. 7. Cloudy: rain early A.M.: rain P.M. 8. Cloudy: rain P.M. 9. Cloudy. 10. Cloudy: rain P.M. 11—13. Cloudy: rain A.M. and P.M. 14, 15. Fine. 16. Rain: rain early A.M. 17. Fine. 18, 19. Cloudy: rain P.M. 20. Fine. 21. Fine: rain P.M. 22. Fine. 23, 24. Cloudy. 25. Rain: thunder and lightning with rain P.M. 26. Cloudy. 27. Fine. 28. Cloudy: rain A.M. 29. Fine. 30. Cloudy. 31. Fine.

Applegarth Manse, Dumfries-shire.—July 1. Heavy rain A.M.: cleared up P.M. 2. Drizzling all day. 3. Heavy rain all day. 4. Fair till 4 P.M. then wet. 5. Showery: fair evening. 6. Rainy. 7, 8. Showery: thunder. 9. Fair all day. 10. Showery. 11. Warm: a single shower: thunder. 12. Very wet. 13. Fine dry day. 14. Wet afternoon. 15. Very wet all day. 16, 17. Occasional showers. 18. Fair till afternoon, then wet. 19. Rain early A.M.: cleared up. 20. Fair all day. 21. Heavy showers all day: thunder. 22. Fair all day. 23. Fair till evening, then rain. 24. Showery all day. 25. Showery afternoon. 26—30. Fair all day. 31. The same: a few drops P.M.

Sun shone out 29 days. Rain fell 22 days. Thunder 3 days.

Wind north ¼ day. North-north-east ¼ day. East-north-east 1 day. East 1 day. South-east ¼ day. South 4 days. South-west 8 days. West-south-west 3 days. West 7 days. North-west 2¼ days. North-north-west 3 days.

Calm 11 days. Moderate 12 days. Brisk 4 days. Strong breeze 2 days. Boisterous 1 day. Variable 1 day.

Meteorological Observations made at the Apartments of the Royal Society by the Assistant Secretary, Mr. ROBERTON; *by* Mr. THOMPSON *at the Garden of the Horticultural Society at Chiswick, near London; by* Mr. VEALL *at Boston, and by* Mr. DUNBAR *at Applegarth Manse, Dumfries-shire.*

Days of Month 1840. July.	Barometer. London: Roy. Soc. 9 a.m.	Barometer. Chiswick. Max.	Barometer. Chiswick. Min.	Barometer. Boston. 8½ a.m.	Barometer. Dumfries-shire. 9 a.m.	Barometer. Dumfries-shire. 8½ p.m.	Thermometer. London: Roy. Soc. Fahr. 9 a.m.	Thermometer. London: Roy. Soc. Self-register. Max.	Thermometer. London: Roy. Soc. Self-register. Min.	Thermometer. Cliswick. Max.	Thermometer. Cliswick. Min.	Thermometer. Boston. 8½ a.m.	Thermometer. Dumfries-shire. Max.	Thermometer. Dumfries-shire. Min.	Wind. London: Roy. Soc. 9 a.m.	Wind. Chiswick 1 p.m.	Wind. Bost.	Wind. Dumfries-shire.	Rain. London: Roy. Soc. 9 a.m.	Rain. Chiswick.	Rain. Boston.	Rain. Dumfries-shire.	Dew point. Lond.: Roy. Soc. 9 a.m.
1.	29·922	29·985	29·809	29·30	29·40	29·60	62·0	68·2	52·4	68	58	55	61	50	s.	sw.	nw.	nbyw.	·133	·01	...	...	58
2.	29·774	29·739	29·544	29·23	29·54	29·31	61·2	66·6	59·6	66	55	54	59½	46½	se.	sw.	calm	sw.	...	·02	·30	...	58
3.	29·540	29·708	29·483	28·99	29·12	29·35	58·8	66·5	56·5	68	51	62	56	50½	w.	w.	w.	w.	·033	...	·16	...	58
4.	29·878	29·810	29·676	29·26	29·55	29·44	61·3	69·2	53·7	72	56	58	59½	47	w.	w.	w.	nw.	·080	...	·10	...	54
5.	29·732	29·710	29·681	29·13	29·34	29·45	63·3	68·6	58·7	69	50	63	60	49	w.	sw.	w.	w.	...	...	·02	...	56
☽ 6.	29·810	29·767	29·434	29·20	29·42	29·19	62·6	75·3	53·3	67	49	62	59	48½	s var.	sw.	w.	wsw.	·016	·14	·02	1·87	55
7.	29·634	29·718	·536	29·00	29·33	29·48	59·7	71·7	50·6	71	51	53	61	48	w.	w.	w.	w.	·138	...	·83	...	55
8.	29·822	29·764	29·625	29·26	29·49	29·50	61·2	66·3	53·8	66	48	60	59	50	sw.	sw.	w.	w.	·025	·46	·06	...	55
9.	29·878	29·928	29·798	29·19	29·64	29·73	59·4	67·3	51·3	68	48	60·5	59	47	nw.	nw.	nw.	w.	·500	...	·05	...	53
10.	29·996	29·946	29·893	29·30	29·74	29·79	60·3	67·7	51·3	67	50	60	63	50	w.	nw.	w.	nnw.	...	...	...	...	53
11.	30·002	29·956	29·924	29·42	29·81	29·82	60·2	66·8	52·6	68	46	56	61½	49	nw.	nw.	w.	n.	...	...	·04	...	54
12.	30·012	29·949	29·905	29·43	29·84	29·85	58·3	69·2	52·2	65	42	55	57½	48	nw.	w.	calm	ene.	...	...	·41	..	53
13.	30·012	30·033	29·950	29·46	29·95	30·04	55·7	62·7	49·4	62	41	56	59½	43	nw.	ne.	n.	w.	...	...	·07	..	53
○ 14.	30·316	30·269	29·942	29·70	30·09	30·04	59·4	70·5	50·2	74	55	59	59½	40½	sw.	w.	calm	sw.	...	...	·05	1·80	50
15.	30·304	30·235	30·137	29·62	29·93	29·87	63·7	77·2	57·0	80	48	65·5	59	51½	s.	sw.	w.	s.	...	...	...	...	54
16.	30·152	30·101	29·919	29·50	29·83	29·71	66·5	74·3	56·0	79	46	58	61	51	s.	s.	calm	wsw.	...	...	·10	...	56
17.	29·998	29·909	29·889	29·36	29·61	29·52	62·7	74·6	52·8	75	56	62	58½	49½	sw var.	w.	w.	wsw.	...	...	·03	...	55
18.	29·778	29·735	29·717	29·18	29·56	29·45	63·7	69·7	58·0	70	56	64	61½	45	w.	w.	calm	s.	...	...	...	...	60
19.	29·700	29·662	29·470	29·05	29·34	29·30	63·7	68·6	58·7	69	49	61	63	53	s.	s.	sw.	s.	...	·06	·04	...	60
20.	29·566	29·511	29·441	28·94	29·24	29·30	63·3	70·0	53·2	69	51	63·5	63½	53	s var.	w.	w.	sw.	·091	·09	·10	...	58
21.	29·630	29·646	29·563	29·00	29·35	29·50	63·7	76·0	55·3	74	47	63·5	64	50½	w var.	sw.	w.	s.	·066	·54	...	...	59
☾ 22.	29·820	29·844	29·757	29·22	29·62	29·70	61·4	70·2	52·7	69	49	60	62	50½	w.	sw.	nw.	wbyn.	·305	·01	·04	1·41	56
23.	30·032	30·013	29·981	29·43	29·78	29·82	59·7	72·4	53·5	65	51	56	59½	50	w.	w.	w.	w.	...	...	...	...	52
24.	30·066	29·993	29·906	29·50	29·74	29·67	61·7	64·5	55·0	66	56	58	58	49	s.	sw.	w.	sw.	...	·02	...	...	54
25.	29·814	29·774	29·646	29·24	29·58	29·59	60·3	67·4	58·5	67	54	58	64	51	s.	sw.	sw.	sw.	·016	·22	·07	...	58
26.	29·694	29·739	29·627	29·16	29·70	29·78	58·8	70·2	56·3	66	54	61	66	53	se.	se.	calm	e.	·291	·05	·24	...	56
27.	29·956	29·926	29·745	29·37	29·79	29·75	61·0	62·4	55·3	70	49	64	64	50½	nw.	sw.	calm	sw.	·105	...	...	...	58
● 28.	30·084	30·078	30·019	29·47	29·84	30·00	61·7	71·4	55·6	74	58	63	65	55	s.	w.	calm	w.	...	·01	...	...	57
29.	30·260	30·171	30·134	29·63	30·08	30·04	64·7	71·8	60·2	75	54	65	66	45½	nw.	nw.	calm	sw.	...	...	·03	...	57
30.	30·148	30·095	30·029	29·47	29·90	29·93	65·4	72·0	60·2	69	51	62·5	65	58½	ssw.	sw.	calm	sw.	...	·05	...	0·20	61
31.	34·210	30·159	30·126	29·59	30·01	30·06	62·3	73·2	58·7	70	45	60	61	49	nw.	nw.	nw.	w.	·016	...	...	...	60
Mean.	29·921	29·898	29·780	29·30	29·650	29·644	61·5	69·8	54·9	69·35	50·77	59 9	61·1	49·4					Sum. 1·815	1·68	2·76	5·28	Mean. 56·

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

XIII.—*Observations on the Genus* Typhlopone, *with descriptions of several exotic species of Ants.* By J. O. Westwood, F.L.S.

Having in my 'Introduction to the Modern Classification of Insects' figured an insect from the collection of C. C. Babington, Esq., under the name of *Typhlopone fulva*, and which, without hesitation, I considered to be a *neuter Ant**, it becomes necessary,—now that Mr. Shuckard has, in a previous page of these Annals, stated his conviction that it is the *female* of a genus belonging to another family, in which neuters do not exist,—that I should give my reasons for the opinion I have advanced, that it belongs to the family of the Ants, and is a neuter insect, and which I still retain.

Ignorant although we are of the males of this genus, it is not only upon a comparison of known individuals of *Typhlopone* with the females and neuters of the Ants, and with the females of the *Mutillidæ*, that I found my opinion; we are now acquainted with four facts relative to the habits of these insects. 1st, One of Mr. Shuckard's specimens is stated by him still to retain within its jaws the wing of a *Termes*. 2ndly, Another, of which the head alone remained, had attacked and pertinaciously retained hold of the leg of an ant, which had evidently pulled off the body of the *Typhlopone*, in order to rid itself of its incumbrance. 3rdly, Mr. Raddon has obtained many specimens of *Typhlopone*, found alive in casks of sugar from the West Indies. And 4thly, Mr. Babington's three specimens were also found in sugar. Now these are circumstances

* I have in this paper continued to employ the term 'neuter' for the abortive sex of the *Heterogyna* and other social *Hymenoptera*, although it is certainly improper, such individuals being, in fact, females, with partially developed female organs. The term 'worker', which has also been applied to them, is not exclusively their own, because the real productive females, amongst the humble-bees and wasps, work as much as the so-called 'neuters'. It would perhaps be better to term them 'pseudo-females.'

which are well known to be the habits of neuter Ants. Of the extraordinary pertinacity with which some of the latter retain hold of these and larger insects, I have collected various notices in my 'Introduction' (v. 2, p. 230.), whilst the partiality of Ants for sugar is very great, and well known. One species is indeed named *Formica Saccharivora* by Linnæus.

I proceed, therefore, to structural peculiarities.

The large and flattened head is not exclusively characteristic of the *Formicidæ*, but the want of eyes and ocelli occurs only in *Typhlopone*, and in various blind ants, mentioned in my 'Introduction' (v. 2, p. 218.). The antennæ are equally similar in structure in *Typhlopone* and several ants. In my drawings of *T. fulva*, made immediately after the meeting of the British Association at Cambridge, the antennæ of *T. fulva* are represented as having only eleven joints; that is, one joint less than the typical number in female and neuter aculeate *Hymenoptera*. A specimen recently given to me by Mr. Raddon, exhibits also eleven decided joints in the antennæ. Mr. Shuckard describes them as "consisting apparently of only ten joints," and blames me for not having described these organs, as well as for having omitted a generic and specific description of *T. fulva* in my 'Introduction,' where they would have been out of place. Mr. Shuckard does not endeavour to show in what way the loss of the two joints, which he states to be wanting, occurs, but he assumes that the circumstance of *Myrmecodes* and other apterous *Mutillidæ* having only eleven joints in the antennæ, proves that *Typhlopone* is allied to those genera. Now Latreille, with true philosophic spirit, has shown how this loss occurs in the *Myrmecodes* and *Myzine* ('Règne Animal,' 5. 316, 318.), namely, by the second joint being lodged within the extremity of the first joint, by which it is hidden. Such is also the case in the *Thynni*, which are the males of *Myrmecodes*; but it is not so in *Typhlopone*, and the loss must be accounted for in some other manner. Mr. Shuckard, indeed, describes the *T. Thwaitsii* as having eleven jointed antennæ, and *T. Spinolæ* as having apparently twelve joints, arising from the large terminal joint being divided in its middle by a slender dark ring, thus proving that it is by the soldering together of the terminal joints, and not by the immersion of the second joint within the apex of the long basal joint, that this is effected. Hence we perceive an identity of structure between *Typhlopone* and the Ants, and a dissimilarity between them and the *Mutillidæ*. The former is still further confirmed by the fact, that I have detected in some species of Ants, which I shall describe at the end of this paper, only ten joints in the antennæ, and that

Odontomachus armatus, Latr. (neuter=*Daceton armigerum*, Perty), *Cryptocerus atratus* (female and neuter), *Atta cephalotes* (female and neuter), and others, have only eleven jointed antennæ, the second joint being exposed. No previous author has noticed this curious circumstance, and Mr. Shuckard stating that "this curtailment is never found in the apterous social *Heterogyna**", thereon founds an unwarranted relationship with the *Mutillidæ*.

The situation of the antennæ close to the mouth, and the elongated basal joint with the following joint affixed so as to form an elbow, are also characters which *Typhlopone* possesses in common with the Ants.

The mouth is remarkable for the extraordinary minuteness of the palpi. The curtailed structure of the trophi (that is, of the maxillæ, labium and palpi) is stated by Mr. Shuckard peculiarly to distinguish the *Dorylidæ* from both the *Formicidæ* and the *Mutillidæ*. But this is not the case, as I have instanced a considerable number of species of ants in which both the maxillary and labial palpi possess much fewer joints than the typical number (Introd. 2, p. 219.).

The structure of the thorax is very interesting in *Typhlopone*. Mr. Shuckard has, however, completely mistaken its formation, considering the prothoracic collar as the mesothorax, and overlooking the true mesothorax. This has evidently resulted from the want of a careful examination of the corresponding parts in the allied groups, and the absence of generalization in the views taken of the thoracic organization; hence, therefore, the erroneous nature of the observations which Mr. Shuckard has published relative to the supposed peculiar distinction between *Typhlopone* and the other apterous *Heterogyna* of both groups, and of the relation between *Typhlopone* and the *Dorylidæ* in this respect†.

The principle upon which the variation in the development of the thoracic segments is regulated, depends entirely upon

* Mr. Shuckard has made some observations relative to the adoption of the term *Heterogyna* of Latreille, contending that the term ought to be retained for the *Mutillidæ*, instead of being applied to the Ants, as it is by Saint Fargeau and Haliday. It appears to me, however, that the term was intended to apply either to the distinction which existed between the winged females of *Formica* and the wingless females of *Mutilla*, or to the difference between the winged females and the wingless pseudo-females of *Formica*. In this latter sense the name is the most appropriate that could be applied to the *Formicidæ* as distinct from every other group of insects.

† Amongst other things, Mr. Shuckard states that when the meso- and metathorax are of unequal size in the winged males of *Heterogyna*, it is the latter which is most developed,—a statement neither confirmed by nature nor by the principle that the segments of the thorax are always in proportion to the size of the locomotive organs which they respectively bear.

the locomotive organs and their action. In wingless insects motion is of course performed by the legs alone, and for this end the thoracic segments are nearly equally developed, especially when the legs are nearly of equal size. This is especially to be seen in the typical *Myrmeciæ* of New Holland, in which, from the elongated form of the body, each segment is necessarily drawn out to its full length of development. Here we find the collar of the prothorax large, oval, longitudinally or obliquely striated, emarginate behind, receiving the front of the mesothorax in the emargination, and which, as well as the metathorax, is transversely striated. The examination of a very few species of neuter Ants will show the more or less gradual coalescence of the meso- and metathorax; the prothorax, however, remaining always most distinct and large, and such is exactly its structure in *Typhlopone*. In the apterous females of the typical *Mutillidæ*, on the other hand, all the segments are consolidated into a single mass.

Of the legs, I shall merely observe, that the employment of the character to be derived from the calcaria is fallacious, because although many Ants possess but one spur to each tibia, there are certainly many which possess two to each of the four hind tibiæ. Such is especially the case in the typical *Myrmeciæ*, in which one of the two spurs of each of the four hind legs exhibits a very beautiful structure. At the same time, there are others, such as *Cryptocerus atratus*, *Pheidole providens*, &c., which are entirely destitute of calcariæ in the four hind legs. And it is moreover to be observed, that both in respect to the spurs and the tarsal ungues, the formation is identical in all the three kinds of individuals of *Myrmecia*, as well as in both sexes of *Thynnus*, and even in both sexes of *Mutilla**. In *Typhlopone* the ungues are perfectly simple: so also may we reasonably expect them to be in their males.

Another circumstance also deserves to be noticed, namely, the entire want of cilia or bristles on the fore legs of *Typhlopone*, a character found in the apterous female *Mutillidæ*, and dependent upon their habits of burrowing in sand. The absence of these appendages consequently either proves that *Typhlopone* is an ant or a parasitic Mutillideous insect; none such, however, have as yet been observed amongst the *Mutillidæ*; indeed it is not only contrary to analogy to suppose that the female of a parasitic aculeate Hymenopterous insect should want wings, (its œconomy rendering the possession of them absolutely necessary for its existence,) but the habits noticed above are sufficient to disprove the supposition.

* In both sexes of *Mutilla Klugii*, for example, each of the ungues of which is furnished with a remarkable seta, as long as the unguis itself.

Lastly, of the abdomen, it may be stated that the pedunculated base is especially characteristic of the ants, and that the trispinose apex is only found, as Mr. Shuckard notices, in an American Ant.

One of the most important characters employed by Mr. Shuckard in his descriptions of the *Dorylidæ*, is that derived from the structure of the male genital organs,—a character which has already been employed by Audouin in the Bombi, and by Vander Linden and others in the Libellulidæ, and proved to be of very great value in determining the species of these insects. Mr. Shuckard, indeed, says, that in respect to its large size in the *Dorylidæ*, "it exclusively resembles several of the solitary *Heterogynæ*," and hence he considers the analogy as strongly in favour of the connexion of these genera with the *Mutillidæ*. He, however, overlooks the fact that the males of all those groups which swarm in the air at certain periods of the year are furnished with very large organs of generation, and for a very evident purpose. This is extraordinarily the case in the wasps, as well as in the hive-bee, the Ephemeræ, Chironomi, and the Ants. As regards the first and last of these groups, reference may be made to the plates of DeGeer's 2nd volume, or the figures 85.5, 88.6, in the 2nd volume of my 'Introduction.' In these groups, however, the males are much smaller than their partners, and therefore the analogy thence assumed in respect to the *Dorylidæ* does not necessarily exist.

Such are the considerations which induce me (although in the absence of an opportunity of ascertaining by internal dissection the state of the sexual characters of the individuals of *Typhlopone* yet observed) to consider these insects as being unquestionably neuter Ants. And as they are equally strong when applied to the African genus *Anomma*, I have no more hesitation in deeming that genus equally Formicideous, as it differs only in trivial characters from *Typhlopone*.

I had proposed to myself to have extended these remarks to an examination of the opinions entertained by Mr. Shuckard relative to the sexual relationship between *Typhlopone* and *Labidus*, the parasitic nature of the *Dorylidæ*, the relationship between the latter and the *Mutillidæ*, and the observations on *Scleroderma*; all of which I consider untenable. I must, however, defer these subjects till another opportunity. Before laying down my pen, however, I must express the pleasure I have received from the careful manner in which Mr. Shuckard has executed the *descriptive* portion of his memoir, and the ingenious manner in which he has treated the *conjectural* part.

By way of supplement, I submit the following descriptions of several Ants, which, especially in the structure of their antennæ and oral organs, serve to illustrate the preceding observations, and to confirm the relationship of *Typhlopone* with the Ants:—

CAREBARA, Westw.

(*καρηβαρῶ, capite doleo*, ob capitis exiguitatem.) Characteres e fœminâ desumpti.

Caput minimum oculis ocellisque munitum.

Antennæ minimæ vix capite longiores, graciles, ad apicem paullo crassiores, supra os insertæ 10-articulatæ, articulo 1^mo^ longo; 2^ndo^ obconico; 3^tio^ præcedenti multo minori, reliquis magnitudine et longitudine sensim increscentibus; ultimo ovali.

Mandibulæ mediocres corneæ curvatæ, apice oblique truncato et irregulariter denticulato.

Maxillæ minutæ, apice in lobum tenuem ovalem terminato. Palpi maxillares minuti 3-articulati articulo 1^mo^ brevi crasso, duobus ultimis gracilibus subæqualibus.

Mentum corneum obovale versus basin attenuato, labium subductum. Palpi labiales minuti graciles biarticulati.

Thorax ovalis, suprà mesothorace maximo fere omnino occupatus.

Abdomen maximum ovale subdepressum segmentis subæqualibus, basi binodosum.

Alæ maximæ; venis ut in fig. 6. dispositis.

Pedes breves tibiis 4 posticis ecalcaratis.

Species unica. *Carebara lignata*, Westw..

Tota luteo-fulva, nitida tenuissimè punctata; facie linea longitudinali sub ocellum medium impressa et versus os furcata; antennis in foveolis inter se et oculos æque distantibus insertis; mesothoracis scuto utrinque linea impresso, parapsides fere efficientibus, scutelloque utrinque parapteris bene determinatis; alis infuscatis, cellula prima submarginali in una alarum anticarum in duas partes vena fere secta.

Long. corp. lin. 10½; expans. alar. lin. 20.

Syn. Myrmica lignata De Haan MSS.

Habitat in Java. In Mus. Hope.

SOLENOPSIS, Westw.

(*σωλήν canalis* et *ὄψις facies*, ob faciem canaliculatam.)

Characteres e pseudo-fœmina desumpti.

Caput maximum subquadratum horizontale posticè emarginatum, suprà linea media longitudinali in duas partes divisum anticè in medio bituberculatum. Oculi parvi laterales ante medium marginis locati.

Antennæ breves graciles prope os in foveolis duabus insertæ; 10-articulatæ, articulis duobus apicalibus majoribus.

Labrum parvum inter mandibulas et supra os deflexum bilobum.

Mandibulæ magnæ valde curvatæ crassæ apice obliquo, edentulæ.

Maxillæ et mentum minima fere membranacea, labium subduc-

tum. Palpi maxillares et labiales biarticulati; gracillimi brevissimi, apice seta instructi.

Thorax valde angustus, prothorace mediocri; mesothorace majori.

Abdomen magnum fere circulare subdepressum segmentis basalibus duobus nodos duos formantibus, segmento proximo maximo.

Pedes graciles tibiis 4 posticis ecalcaratis, unguibus tarsorum simplicibus.

Species unica. *Solenopsis mandibularis*, Westw.

Tota castaneo-fulva nitida tenuissime punctata, hirta; oculis, margine antico capitis acuto, mandibulisque nigris; abdominis apice fusco, mesothorace utrinque in tuberculum conicum elevato; nodo 1^mo^ pedunculi abdominalis elongato, apice elevato-conico, 2^ndo^ brevi subrotundato.

Long. corp. lin. 3.

Habitat in America Æquinoctiali. D. L. Guilding.

In Mus. D. Hope.

This insect is so closely allied to the *Pheidole providens*, W. (*Atta providens* of Col. Sykes, figured in the Transactions of the Entomological Society, vol. i. pl. 13. fig. 5.), that it can only be regarded as a geographical subgenus, distinguished chiefly therefrom by the peculiarity of its antennæ and the smooth and glossy body. As the former has not hitherto been characterized generically, I take this opportunity of doing so.

PHEIDOLE, Westw.

Sub-genus Asiaticum Solenopsidi proximum.

Caput maximum posticè emarginatum anticè haud bituberculatum, striolatum obscurum, anticè linea utrinque obliqua impressa versus oculos ducta in quibus insident antennæ 12-articulatæ, graciles breves, articulo 2^ndo^ sequenti majori, tribus ultimis magnis clavam formantibus. Mandibulæ crassæ intùs concavæ extùs curvatæ apice truncato (in fig. supr. cit. erroneè dente medio depictæ).

Labrum, maxillæ, labium, mentum, palpi, pedes, pedunculus et abdomen ut in *Solenopside*.

Species unica, *Pheidole providens*, W.

Atta providens, Sykes, loc. cit. supr.

Habitat in India Orientali. D. Sykes.

The following are descriptions of the individuals of *Typhlopone* which have fallen under my notice, and which are distinct from those described by Mr. Shuckard:—

Species typica, *Typhlopone fulva*.

Luteo-fulva nitida tenuissime punctata, capite posticè nonnihil angustiori, margine postico parum emarginato, margine antico nigricanti, tuberculis duobus mediis in lineas elevatas posticè productis desinentibus et inter has carinas canali impresso posticè ad tertiam partem capitis ducto et gradatim terminato; antennis in fossulis duabus mediocriter impressis, insertis: castaneis 11-articulatis articulo 1^mo^ fulvo; ultimo articulis tribus

antecedentibus vix majori; mandibulis castaneis apice nigro; metathorax æqualis haud impressus; pedunculus abdominis anticè subtruncatus, postice latior angulis lateralibus posticis rotundatis; subtùs ad basin angulariter productus. Mandibulæ ad apicem subacutæ angulo prominente versus medium lateris interni denteque parvo paullo sub apicem, spatio inter angulum et dentem subapicalem subserrulato.

Long. corp. lin. $4\frac{1}{2}$.

In Mus. D. C. C. Babington. In saccharo detecta.

Individuum alterum etiam in saccharo detectum differt statura minori, lineas $3\frac{1}{2}$ longitudinis tantum habens, colore obscuriori sc. testacco-fulvo; dente mandibularum subapicali magis prominenti angulo medio tamen fere obsoleto, canali faciei nisi inter carinas frontales obliterata.

Typhlopone Shuckardi.

Testacco-fulva nitida tenuissimè punctatissima; capite lateribus parallelis, posticè valdè emarginato fronte carinata et canaliculata ut in *T. fulva*; antennis picco-castaneis 11-articulatis articulo ultimo duobus præcedentibus paullo majori, mandibulis piceo-castaneis apice nigricantibus, dente subapicali minuto et obtuso vix prominente; metathoracis dorso canaliculato; pedunculo abdominis subtùs versus basin in hamum brevem acutum producto, abdominis apice 5-denticulato, denticulis lateralibus majoribus.

Long. corp. lin. 5.

In Mus. nostr. Communic. D. Raddon. In saccharo detecta.

Typhlopone Dahlbomii.

Pallidè lutea, mandibulis obscurioribus; nitida tenuissimè punctatissima, capite lateribus subparallelis posticè vix emarginato impressionibus duabus frontalibus magnis rotundatis in quas insident antennæ breves clavatæ 11-articulatæ articulo ultimo maximo (præcedentibus 5 majori); impressionibus carina media tenui anticè dilatata separatis; canali omnino obsoleto, mandibulis apice acutis dentibusque duobus magnis et acutis intùs armatis; metathorace haud canaliculato pedunculoque abdominis subtùs inermi, æquali.

Long. corp. lin. $1\frac{1}{2}$.

In Mus. D. C. C. Babington. In saccharo detecta.

DESCRIPTION OF THE FIGURES.—Plate II.

Fig. 1. *Typhlopone fulva*, W. Magn. auct.
1 *a*. Labrum; 1 *b*. mandible; 1 *c*. maxilla; 1 *d*. labium; 1 *e*. antenna; 1 *f*. abdominal pedunele; 1 *g*. posterior tibia and tarsus.

Fig. 2. Thorax and abdominal pedunele of *T. Shuckardi*, W.; × prothoracic collar; + mesothorax; 0 metathorax.

Fig. 3 *a*. Front of head of *T. Dahlbomii*, W.; 3 *b*. antenna of the same.

Fig. 4. *Anomma Burmeisteri*, Sh. Magn. auct.
4 *a*. Front of its head.

Fig. 5. *Solenopsis mandibularis*, W. Magn. auct.
5 *a*. Underside of head; *md*. one of the mandibles, the other removed;

l 1. labrum; *m* × maxilla; *l* 2. labium; 5 *b*. labrum; 5 *c*. mandible; 5 *d*. maxilla; 5 *e*. labium; 5 *f*. antenna; 5 *g*. thorax and basal joints of abdomen; × prothoracic collar; + mesothorax; 0 metathorax.

Fig. 6. *Carebara lignata*, W. Mag. nat.
6 *a*. mandible; 6 *b*. maxilla; 6 *c*. labium; 6 *d*. antennæ.

Fig. 7 *a*. Thorax and basal joints of abdomen of *Pheidole providens*, W.; × prothoracic collar; + mesothorax; 0 metathorax; 7 *b*. and 7 *c*. mandibles in different position.

XIV.—*Zoological Notices.* By Dr. A. Philippi*.

[With Two Plates.]

1. On *Clavagella balanorum*, Scacchi. Plate III. fig. 1—6.

Cl. vagina adnata, abbreviata, apertura simplici; valvis subtriangularibus; libera tenui, rugosa, parum convexa; spinis fistulosis irregularibus absconditis.

Habitat in cespitibus Balanorum ad costam Pausilypi prope Neapolin.

In December of the preceding year Sig. Scacchi made the highly interesting discovery of this living species of *Clavagella*, and communicated it to the Royal Neapolitan Academy; but since years will pass away before the Memoirs of this Academy will appear in print, I believe I shall be doing a great service to zoologists in giving a detailed description of his discovery. We have examined the animal in company, but the observation on the formation of the spinoid tubes is due alone to Sig. Scacchi.

The tube is short, at the most $1\frac{1}{2}$ inch long, very thin walled, and cohering most intimately with the surrounding bodies (almost always *Balanus balanoides*); rarely does it project one or two lines. It is compressed, measures about $2\frac{1}{2}$ lines in the one, $1\frac{1}{2}$—2 in the other dimension; its superior (upper) aperture is simple; it terminates inferiorly in general in a pear-shaped expansion, in which the *shell* is situated. This consists of a free and of an adhering shell. The *free shell* is the right one; it is of an irregular structure at the dorsal margin (Rückenrande), frequently concave, and seldom exceeding 6 lines in length and 4 in breadth. It is thin and very slightly vaulted, so that there is a wide space on the ventral side between the two shells, which is closed by the thick mantle of the animal. The *lines of growth* are very distinct, and what is very remarkable, they do not run parallel with the

* Translated from Wiegmann's 'Archiv,' Part 2, June, 1840.

ventral margin, but with the anterior margin; so that the point of commencement of the shell is situated at its hinder end, and not at the vertex (Wirbeln), as in other Conchylia. It appears that a great portion of the dorsal margin is subsequently re-absorbed. The vertices thence appear in part uncinate. The left *adhering shell* is exceedingly thin, otherwise similar to the other. The two shells inwardly, as well as the tube, are of a nacreous lustre; thus rendering it extremely difficult to distinguish mantle and muscular impressions. A *hinge* is entirely wanting, and there is even no peculiar cartilaginous ligament; I merely find a weak fibrous corneous ligament. (Fig. 4 *b*.) Where the two shells touch one another at the back there is frequently a projection in the tube, and we in general meet with an oblique projection (Vorsprung) where the space for the shell ceases and the true tube commences. The *spinoid tubes* are present; they are irregular, and are only employed by the animal where it finds a free space in the *Balanus* mass. They are in general lost on loosening the house, so that rarely any other trace remains of them than the point-like apertures in the interior of the shell, as I have represented in fig. 2 *e*. In some successful cases, however, they are seen very distinctly.

The *animal* has exactly the form of a sack, which in front has but a very small fissure, out of which the apex of the very thin foot can scarcely exsert itself. (Fig. 1. and 4.) Posteriorly the mantle is prolonged into two *siphons*, cohering nearly to the apex, which reach to the extremity of the tube. The common portion of the siphons terminates with a fringed border, and then follow two very short tubes, of which the inferior or branchial siphon is broadest. Both are provided at their aperture with simple cirrhi, and are carmine red, while the remainder of the animal is colourless. It has, moreover, to be observed, that the common tube before its border is covered with a quantity of grains of sand, which are not easily separable from it. (See Fig. 3.) Fig. 4. exhibits the animal, after having been some time in spirits, lying on the right shell. The two *adductores*, of which the posterior one is round and large, the anterior one kidney-shaped and small, are at present very distinct. If the mantle is cut open in the ventral line, it is first observed that the mantle in the ventral side is very thick and fleshy; posteriorly the strong muscles which draw back the siphons are in view; in the centre, the semicircular branchiæ, out of which the small narrow vermiform *foot* (*d* in fig. 5. and 6.) projects; and above this, on each side, two very long, linear, somewhat curved *appendices buccales, c.* On each side there is only *one*

branchia, which however has fixed itself in the neighbourhood of the back, and has above the seam another narrow appendix, which might be compared with the second branchia, and which half surrounds with its free margin the anterior closing muscle. The branchiæ of both sides cohere in the seam with the posterior half. They are strongly and distinctly striped. Remarkably small is the mass of intestines which project free between the branchiæ. See fig. 6, where this is separately represented.

Respecting the formation of the spinoid tubes Sig. Scacchi says, in his memoir read to the Academy, which he has communicated to me in manuscript, as follows:—

"Rang is of opinion that the spinoid tubes served the purpose of allowing the exsertion of a kind of byssus, with which the animal fastened itself to the basis of its dwelling; but no observation supports this view, and I believe I may say with certainty that the *Clavagellæ* have no byssus; moreover, every one will easily conceive how useless this would be to them, since they cohere immoveably to one of their shells. Since they live in the midst of sea-acorns (*Balani*), which form a group of empty shells which grow one upon the other, it must necessarily happen that the *Clavagella* on increasing meets with the cavities of the surrounding *Balani*, when it absorbs or destroys everything round about in order to render its dwelling more spacious. Now observation has shown me, that when such cavities open near the animal, some fleshy fibres proceed from the great muscle which joins the margins of the mantle, and there direct themselves to the place where the cavity of the balanite is open, and form small calcareous tubes. They generally terminate with two small branches which finally close, yet I have sometimes found in some a small aperture at the end. These tubes prevent the entrance of any foreign body, and distribute themselves like the roots of plants, so that those which come near to the inner surface of the *Balani* adhere to it; the others either remain free or attach themselves to sand, and any other foreign substances they accidentally meet with. It appears that but few days are necessary for the formation of these tubes, as among so many individuals which I have had occasion to examine alive, I have only twice had the pleasure to surprise the animal with the above-mentioned fleshy filaments, which lie in the tubes that were just formed; and some other times I have met with some of these filaments, which having performed their office, were dried and now hung as appendices of the epidermis to the great muscle of the mantle." These spinoid tubes serve then the animal to fix itself, and are consequently most

strongly developed in those species which live in sand, as for instance, *Clavagella bacillaris.*

PLATE III. *Fig.* 1. *Clavagella Balanorum*, Scac. Sitting in a mass formed for the greatest part of *Balani* overgrown with Sponges, *Serpulæ*, &c., in natural size somewhat contracted; the one wall of the cavity is removed.

a. The fissure in the mantle, through which the foot is exserted.

Fig. 2. The animal is removed; the left shell cohering with the tube is seen, upon which the two muscular impressions are indicated. The points *e.* are the apertures of the spinoid tubes.

Fig. 3. The end of the siphons, magnified, to show that the common part of it possesses its peculiar fringed border.

Fig. 4. The animal killed in spirits, much contracted, lying on the right shell.

a. The mantle fissure for the foot.

b. The rudimentary ligament.

c, *d.* The two adductors.

Fig. 5. The same, the mantle cut open in the neighbourhood of the ventral line, and thrown back. The branchiæ, the foot *d*, the *appendices buccales*, of which only the two of the one side are represented, are seen.

Fig. 6. The foot with the belly or intestinal mass of the animal, magnified.

2. The genus *Zoë* is the first state of *Pagurus.* (Fig. 7. and 8.)

No genus among the Crustacea is perhaps more remarkable, and has more exercised the ingenuity of naturalists with respect to the place it must occupy in the System, than the curious animal discovered by Bosc, and named by him *Zoë*, and but exceedingly few naturalists have seen it again after him. He placed it between the Branchiopoda and the Flea-crabs (Flohkrebse); Latreille, in the first edition of Cuvier's 'Règne Animal,' in the order Branchiopoda, between *Polyphemus* and *Cyclops*; at the same time expressing the opinion that it might perhaps belong to the division of the Schizopoda. This latter opinion was adopted by Leach, but most zoologists have placed *Zoë* among the Branchiopods. To these doubts respecting the nature of this animal a new one associated itself, by Mr. Thompson announcing that these curious animals were nothing more than the larvæ of the common crab (*Carcinus Mœnas*), which underwent a true metamorphosis. This opinion was strongly opposed by Mr. Westwood. Lastly, Milne-Edwards is of opinion (see Lamarck, 'Hist. Nat. des Anim. sans Vert.' edit. 2. vol. v. p. 195.) that *Zoë* might indeed only be the young state of a species of Decapod, but belonging probably to his division of the Anomoura (in which he includes *Dromia*, *Homola*, *Albunea*, *Pagurus*, &c.). Accident has afforded me the opportunity of

making the direct observation, that in effect *Zoë* is nothing more than the first stage of *Pagurus*.

On the 13th of March of this year, I found in Palermo, in a basin in which I kept several sea animals, to my great joy, about a dozen individuals of *Zoë*, but unfortunately already all dead. I hastened to examine them under the microscope as well as possible. The next morning I found to my great surprise the same basin, in which I had the previous day fished out with great trouble a dozen *Zoë*, quite filled with several hundred *Zoë*. I had among other animals in the basin a *Pagurus hungarus*, Herbst., which sat in a *Natica millepuncta*: I immediately conceived the suspicion that the *Zoë* must be its young, broke carefully the *Natica*, and found, in fact, the ovary of the *Pagurus* nearly quite empty, while in the remaining ova I distinctly recognised the little *Zoë*. I freed it with some trouble from the tunics (Eihäuten of the ovum). These small *Zoë* were perfectly transparent, with black eyes, a red spot in the medial line immediately behind the eyes, and at times with a second red stripe before the anus. These red spots are evidently in the intestinal canal, and are remains of the yelk. The cephalothorax occupies two-fifths of the length of the animal, and is prolongated in front into an apparently horizontal beak, posteriorly rounded, behind the eyes slightly constricted. The neighbourhood of the eyes projects vesicularly. The *abdomen* is not quite twice as long and five-articulated. The four first segments are cylindrical and gradually increase in length; the last has the form of a fan, and bears twelve radiately-placed spines, of which the outer ones are the shortest. The *eyes* are sessile, very large, black, reticulately latticed. The *exterior antennæ* are biramificate, and originate on the under side; their common petiole scarcely projects to the margin of the cephalothorax; the outer branch is pretty broad, terminates exteriorly with a spine, and bears at its apex a number of bristles: the inner branch is shorter, much narrower, and bears only two bristles. Between the two ramifications there is another short semifalcate, slightly ciliated member. The *inner antennæ* are as long as the outer ones, narrow, biarticulated, and terminate with two bristles. Of all the other organs I only recognised the two perfectly similar pair of feet, which are biramificate, and recall to mind *Cyclops*. The outer branch is triarticulated, the inner somewhat stronger one quadriarticulated. The terminal joint is in both short and acute, and furnished with long bristles. All the longer bristles of the feet, as well as those of the antennæ, are ciliated.

Fig 7. *Zoë*, the young of *Pagurus hungarus*, Herbst, very highly magnified.
Fig. 8. The same, still in the egg, likewise very highly magnified.

3. *Asterope*, a new Genus of Ostracopoda. Plate III. fig. 9—11.

I had frequently found in the sea-sand, and between Zoophytes, *Cytherina*-like shells of several species, which differed essentially from *Cytherina* by an incision (indentation) in the shell, but only on the 6th of March of this year did I succeed in finding in Palermo an individual with the animal. If indeed it was not possible for me to distinguish all its organs, yet I fully convinced myself that the animal also is so considerably distinct both from *Cypris* and *Cytherina*, as well as from *Cypridina*, Milne-Edwards (which genus I have likewise been so fortunate as to observe), that it must necessarily form a separate genus.

The shell is only half a line long, of a brownish colour, perfectly elliptical, but has in front and beneath an incision, and on both sides of this incision the margin is thickened. Beneath the incisure lie the antennæ; behind the first pair of feet, at the hinder extremity, the apex of the tail peeped out. With a greater magnifying power the shells appeared beset with opake white points. The shells could be easily removed, and the animal now appeared as shown in fig. 11. Immediately behind the eye, which on being pressed between the glass plates showed itself to be a *double* one, a pear-shaped *muscle* is directed upwards, and serves to fasten the animal on each side to the shells; behind which I observed a couple of cylindrical annulated filaments provided with some bristles, and behind these still two other pair, shorter, thicker filaments, not annulated, and not furnished with bristles. These organs probably serve for the adhesion of the eggs. There is only one pair of *antennæ*, the greatest organ on the whole animal, as it equals the body in length. They are situated immediately beneath the eyes, have a large ovate basal joint, which forms with a second cylindrical joint of the same length the petiole, and terminates with a short many-jointed flagella (Geissel) beset brush-like with long bristles. There are two pairs of feet, both of which are directed forwards, and seem to be only biarticulate; both joints are subelongate, much compressed, nearly foliaceous, and ciliated with few but strong bristles. The *tail* is compressed, broad, curved downwards, and somewhat forwards, and furnished with about ten hooks, which are first at the apex bent, then curved backwards, and which gradually decrease in size from the front hindwards. At the base of each foot are situated two nearly triangular lamellæ, which are anteriorly bent outwards, and densely beset with long stiff cilia, fig. B. query branchiæ? Behind these and before the tail I

noticed another differently formed, and short ciliated lamella, fig. *g*. I moreover found three pairs of falcate palpi or foot-jaws with long cilia, fig. *c*. I did not, however, succeed in observing the other cibarian organs.

Notwithstanding the imperfection of these observations, they still sufficiently prove the independence of this genus. It differs from *Cypris*; 1. by the incision of the shell; 2. by the existence of two eyes; 3. by the broad hook-bearing tail; 4. by having only two pairs of foliaceous feet; 5. by possessing peculiar organs for bearing the eggs, which function in *Cypris* is performed by the third pair of feet. *Asterope* is distinguished from *Cypridina*; 1. by the incision of the shell; 2. by the presence of only two pairs of foliaceous feet; 3. by its simple tail (in *Cypridina* it consists of two lamellæ), &c. *Cytherina* differs from *Asterope*; 1. by the want of the incision of the shell; 2. by the presence of *four pairs of feet*, as quite correctly stated by O. F. Müller; 3. by the tail consisting, as in *Cypridina*, of two lamellæ. (I have observed about eight species of *Cytherina* near Naples.)

The generic characters were accordingly as follows:—

Testa bivalvis, corpus abscondens, antice subtusque incisa. *Antennæ* duæ simplices, apice penicillatæ. *Oculi* duo! *Pedes* quatuor compressi, subfoliacei. Fila peculiaria ad retinenda ova. *Cauda* compressa uncinis pluribus terminata.

The species might be characterized in the following manner:—

Asterope elliptica. A. testa exacte elliptica, nitida, sublente fortiori, punctis opacis albis adspersa.

Plate III. *Fig.* 9. *Asterope elliptica*, Phil. Magnified.
A. Its natural size.
Fig. 10. The left shell, inside view, moderately magnified.
Fig. 11. The animal magnified sixty times.
B. One of the four lamellæ attached to the base of the feet, still more highly magnified.
C. One of the three pair of lamellæ, which are situated near the cibarian apparatus.
g. The lamellæ between the feet and tail.

4. Short characteristic of several new Genera of the Family of the Copepoda.

During the great heat of the summer months I have occupied myself in Sorrent in examining the minute animals which live among the small Algæ. Here dwell, only to speak of the Crustacea, especially *Caprellæ*, some *Dynamene*, *Janira*, *Jassa*, *Juera*, which latter three appear to be very rare; numerous

Amphithöe, some *Gammari*, and above all *Cytherinæ*, and a vast number of *Cyclops*-like animals, together with *Peltidiæ*, and an allied genus. The new genera which I found among them I will now briefly enumerate, reserving a more detailed description of them for a longer labour.

1. *Nauplius*, mihi (non O. F. Müller*). (Fig. 12.)

Corpus elongatum, postice sensim attenuatum, segmento primo s. capite (cum segmento primo thoracis connato) maximo; *cauda* bifida, setigera. *Antennæ* quatuor; superiores multiarticulatæ, apice penicillatæ; inferiores tri-?articulatæ, apice setis uncinatis, basi seta pectinata munitæ. *Pes masticatorius* ungue incurvo falcato. *Pes primus* capiti insertus, desciscens, biramus, ramis elongatis, apice unguiculatis. *Pedes natatorii* birami sex. *Pedes spurii* duo, e lamellis duabus basi communi insidentibus formati, sacculum ovorum ex parte obtegentes.

This genus is abundant in species. It is distinguished from *Cyclops*; 1. by the varying construction of the first pair of feet which do not serve for swimming; 2. by the foot-jaw; 3. by the lamella, with cover for the greater part of the ovary. It is remarkable that the foot-jaw and first pair of feet are exactly so constructed as in the genus *Peltidium*†, which genus I have been able to investigate more completely on a couple of new species than it was possible on *P. purpureum*.

2. *Laophonte*, mihi. (Fig. 13.)

Omnia ut in Naupliis, sed primum corporis segmentum cum capite non coalitum, ideoque *par primum pedum desciscens* non capiti sed segmento peculiari thoracis insertum, biramum, ramo altero minimo rudimentario, altero ungue unico maximo terminatum.

Only one species, but very common; the back appears serrated, from the individual segments being placed sharply from one another.

3. *Psamathe*, mihi. (Pl. IV. fig. 1.)

Corpus elongatum, semiteres. *Pes masticatorius* lamellis duabus terminatus. Pedes sex, birami, natatorii. *Pedes spurii* duo, biarticulati, angusti. Reliqua ut in *Cyclope* vel in *Nauplio*.

Only one species, rare, elongated as *Cyclops*, but at the same time flat, thus forming the transition to the scutiform Copepoda. The cibarian apparatus is very peculiar, almost exactly as in the scutiform genus *Thyone*. Very remarkable

* O. F. Müller gave this name to the young state of *Cyclops*.

† For description and figure of this new genus, see Ann. Nat. Hist. vol. iv. p. 303. Pl. IV. fig. 12, 13.—Edit.

is the parallelism between *Nauplius* and *Peltidium*, and between *Psamathe* and *Thyone*.

4. *Thyone*, mihi. (Pl. IV. fig. 2.)

Corpus depressum scutiforme, ovatum, segmentis quinque constans, segmento primo maximo. *Cauda* e lamellis duabus formata. *Oculi* duo confluentes. *Antennæ* quatuor; anteriores multiarticulatæ; inferiores triarticulatæ, apice setis uncinatis, basi seta pectinata munitæ. *Pes masticatorius* apice lamellis duabus terminatus. *Pedes* sex, natatorii, birami; *Pedes spurii* duo lamellares, spatium inter segmentum penultimum caudamque opplentes.

Three species, the one, *T. viridis*, nearly $\frac{3}{4}'''$ long, common. The cibarian apparatus exceedingly complicated.—*Peltidium* differs by the foot-jaws, the tail, and by the first pair of feet being differently constructed; *Sapphirina*, Thompson, from the body having nine segments. There are two pairs of peculiar fringed lamellæ near the cibarian organs (fig. 2 *e.* and *g.*), perhaps analogous to those lamellæ in *Cypris*, regarded by Strauss as branchiæ.

5. *Peneus siphonoceros*, mihi. (Pl. IV. fig. 3.)

P. rostro brevissimo, supra 7-dentato inermi; flagellis antennarum superiorum æqualibus, omnibus quatuor canalem clausum formantibus.

I have gradually obtained in Naples about half a dozen individuals of this *Peneus*, so highly remarkable for the curious formation of the flagella of the upper antennæ. They are flesh-coloured, the antennæ, feet, and the hinder margins of the abdominal segments darker. The length from the apex of the beak to the extremity of the tail amounts to $2\frac{1}{2}$ inches, of which the abdomen is 1 inch 7 lines, and the beak scarcely $2\frac{1}{2}$ lines. The cephalothorax has no longitudinal furrows. The abdomen is, as usual, very much compressed, the last three joints keeled. The terminal segment has in the centre a broad groove, and terminates with two points. The scale (Schuppe) of the *exterior antennæ* is quite twice as long as the beak, of usual form, with a longitudinal groove; the stalk does not attain to half the length of the scale; the flagellum is once and a half as long as the body. The *inner antennæ* have a very thick stalk, as long as the scale of the outer antennæ, at the base excavated, as usual, for the large black eyes, and with a curved anteriorly directed appendage (process). They have two equally long, and as above stated, very peculiarly formed flagella. They form, namely, with those of the other side, an almost closed tube. For this purpose each single

flagellum is vaulted exteriorly with a keel, interiorly grooved, serrated and finely ciliated at the margins, so that they close completely. The canal continues in the stalk (Stiel), but here only the upper half is formed by the stalk, and is closed inferiorly by the scales of the outer antennæ, as it seems the upper lip divides the canal, which then proceeds right and left to the branchiæ. As far as I am aware, no similar formation exists among the Crustacea.

The *feet* are exactly as in the other species of *Peneus*; all have at the base a filamentary process corresponding to the palpi of the foot-jaws; the three first pair have pincers (*chelæ*), and increase from the first to the third in length, which increase is effected, namely, by the growth of the tibia. The fourth pair of feet is as long as the second, the fifth as long as the third. The *exterior foot-jaw* is nearly twice as long as the first pair of feet, and consists of rather cylindrical and capillary joints.

The figure. Pl. IV. fig. 3. will render a more detailed description superfluous.

Plate III. *Fig.* 12. *Nauplius ciliatus*, Phil. Sixty times magnified.
a. Natural size.

Plate III. *Fig.* 13. *Laophonte cornuta*, Phil. Female, sixty times magnified.

Plate IV. *Fig.* 1. *Psamathe longicauda*, Phil. Magnified sixty times.
x. Natural size.
a. The outer foot-jaw magnified 150 times.

Plate IV. *Fig.* 2. *Thyone viridis*, Phil. Examined with a power of sixty.
a. Nat. size.
b. The outer foot-jaw, with its palpus more strongly magnified.
d. The second pair of antennæ.
e. The mandible, near it a foliaceous fringed organ similar to the one designated by *g*: should it be considered as branchia?
f. The one foot-jaw.
N.B. The maxillæ could not be represented on this scale.

Plate IV. *Fig.* 3. *Peneus siphonoceros*, Phil. Nat. size.
a. Cross section of the tube formed by the flagella of the upper antennæ, magnified.

6. *Pontarachna punctulum*, Ph., an Hydrachnidan of the Ocean. (Pl. IV. fig. 4. and 5.)

Hitherto Hydrachnæ have been found solely in fresh water, but I have met with, and not at all unfrequently in the bay of Naples, a spider belonging to this division of the Arachnida likewise in sea-water. Unfortunately it is so minute, scarcely ⅓rd of a line in length, that I have not been able to recognise all its parts, although I have frequently examined several specimens. The *body* is rather globular, anteriorly somewhat acute, quite bare. Its colour is brownish-yellow, more fre-

quently orange-red or brown-red, sometimes even brown with whitish transparent variously indented (gezacktem) margin, so that rarely two individuals look perfectly like one another; I once found one which was very beautifully marked with a white T on a dark-brown ground. The pale margin is anteriorly broader, so that the two minute distant *eyes* may distinctly be recognised. The front *feet* scarcely exceed the length of the body; the posterior ones are nearly twice as long. The four coxæ are close to each other on every side, and the anterior ones even touch in the central line. (See Pl. IV. fig. 5.) Between the coxæ I find two small points, of the importance of which I am not able to form an opinion. Of the following joints the first are the shortest, the last the longest; in gradual progression they are all nearly cylindrical; nevertheless the *femur* seems to be excavated above, the tibia slightly below. All the joints, with the exception of the last, are beset on the under side, at the extremity, and likewise in the centre, with bristles. The last is perfectly bare, at the extremity obliquely truncated above, and bears two hooked claws curved under a rather acute angle. Upon the under side of the body there is an annular pointed lamella which surrounds the fissure of the generative organs, fig. 5. *f*, as in *Diplodonta* and *Atax*. Of the cibarian organs I have only been able to distinguish the two *palpi*. These are nearly half as long as the anterior feet, filiform, and quinquarticulated. The first joint is very short; the second and third thick and cylindrical; the fourth the longest of all, likewise cylindrical, but much thinner; the fifth short and acute. Palpi and feet are nearly colourless, at the most yellowish.

Of the six genera which at present constitute the division of the Hydrachnæ, viz. *Diplodonta, Atax, Arrhenurus, Eulais, Limnochares* and *Hydrachna*, it agrees by the annular lamellæ surrounding the sexual apparatus and other characters, mostly with the first; but differs from them;—1. by the four coxæ being close on each side; 2. by the construction of the palpi, which in *Diplodonta* have at the fourth joint an apex of the length of the fifth;—*Atax* possesses a very long fourth joint, which at the extremity is somewhat excavated in order to receive in the outer bend the fifth joint. The other four genera differ still more: *Arrhenurus* and *Limnochares* by the very short palpi; *Eulais* by the palpi and the hips; and *Hydrachna* by the palpi, the beak, &c. It hence follows, that even disregarding the maxillæ not discovered by me, there are differences enough to justify the establishment of a new genus, which I call *Pontarachna*, and characterize as follows:—

Corpus subglobosum. Oculi duo, remoti. Mandibulæ . . . nullæ?

minimæ? Palpi duo, elongati, 5-articulati; articulo quarto longiori, quinto brevi, acuminato. Coxæ utriusque lateris unitæ, anticæ duæ in linea mediana quoque sese tangentes. Pedes unguibus duobus uncinatis terminati. Vulva lamina crustacea granulata cincta.

PLATE IV. *Fig.* 4. *Pontarachna punctulum*, Phil. Drawn magnified sixty times.
g. Nat. size.
Fig. 5. The body beneath, magnified ninety times.
d. The palpi.
e. The coxæ.
f. The plate surrounding the fissure of the generative organs.

7. *Desmophyllum Stellaria*, Ehrenberg. (Plate IV. fig. 6.)

The genus *Desmophyllum*, established by Prof. Ehrenberg in the Memoirs of the Berlin Academy, is not less remarkable by the characters of its calcareous stem, which is constantly unramified, and has fascicularly united lamellæ of the star (Sterne), than by its animal. In this the surprising thinness of the mantle is above all remarkable, which seems to be entirely missing, so that we can most distinctly perceive through it the cells at the margin of the star, nay, even the slightest roughness of the surface. Indeed the animal mass is in proportion to the calcareous mass a true minimum, and so retracts itself on the contraction of the animal into the cavities of the lamellæ, that I regarded the individual I received in this state for the mere house, long before deprived of its inhabitant. I have likewise observed the same on *Cladocora cespitosa*, Ehrenberg (*Caryophyllia*, Lamk.), while the animal mass of *Cladocora* (*Caryophyllia*) *Calycularis* is far more considerable, and even on drying remains as a pretty thick membrane. When the animal of *Desmophyllum Stellaria* has fully expanded itself, it projects about a line above the star, while the border to a good breadth seems to be without any animal envelope. The yellowish coloured oval *mouth*, surrounded by an inwardly and outwardly folded lip, is distinctly perceptible. True *tentacula* are missing; a greenish fleshy mass extends from the mouth to near the margin of the star, and is there drawn out into several folds, at the apex yellowish, which, however, do not evince any definite arrangement, yet generally exhibit two rows. When the folds are most distinct they project at the furthermost only $\frac{1}{3}$rd of a line; greater I have never seen, although I have preserved the animal alive, and observed it for several days. By this want of true *tentacula* the genus differs, likewise with respect to the animal, very essentially from *Cyathina*, Ehrenberg, where the *tentacula* are very regular, filiform, and orbiculate (geknöpft). All

the motions of the animal are in the highest degree slow and sluggish, which I have likewise observed in *Cyathina*, *Oculina* and *Cladocora*.

Plate IV. *Fig.* 6. *Desmophyllum Stellaria*, Ehrenberg. Nat. size, sitting on *Nullipora Lithophyllum expansum*, Phil.

XV.—*Thoughts on the Equivocal Generation of* Entozoa. By Jas. L. Drummond, M.D., Professor of Anatomy and Physiology in the Royal Belfast Institution, &c.

In studying the *Entozoa*, one of the first things which demands our attention, is the peculiarity of the situations which they occupy. When we look abroad upon the features of the globe which we inhabit, we find that every part is filled with animal and vegetable life; whether we visit the frozen regions of the poles, or the countries for ever exposed to the heat of an equatorial sun, we see that every clime has its animals and plants, and these in general, so constituted in their structure and œconomy, as to be fitted peculiarly for the circumstances of the place in which they reside. The White Bear delights in the perennial snows and ice of its native region, and the Lion in the fervour of the torrid zone; but were they to change situations, the former would die from the excessive heat, and the latter would as certainly perish from the intolerable cold.

And so it is with the *Entozoa*; they have been ordained to inhabit, alone, the interior of other animals; and though many of them will live for several days when removed from that situation and put in water, yet that can only be deemed a lingering death, for at length they infallibly perish from the unnatural circumstances in which they are placed. It has been asserted, indeed, that some of the intestinal worms have been found living in other situations. Thus, Linnæus supposed that the Fluke-worm (*Distoma hepaticum*) was to be found in fresh water, as also the common Tape-worm in muddy pools, and the *Ascaris vermicularis* in marshes among the roots of decaying plants. (Rudolphi, i. 371.) But it has been shown by Muller and Rudolphi, that he had mistaken other external species of animals for true *Entozoa*; that his supposed Tænia and Fluke-worm were the *Planaria lactea*, and his *Ascaris vermicularis* a quite different animal.

But even admitting that a true entozoon should be found in a pool or rivulet of fresh water, still something more would be necessary to prove that such was its natural habitat. Every one knows that when an animal is infested with Tape-worm, portions of the latter are frequently ejected along with the

alvine excretions, and therefore the circumstance of a specimen being found in water inhabited by fish of any kind may amount only to this, that it had originally belonged to the fish. Thus the celebrated Muller, when travelling on the borders of Sweden, was told of a rivulet in which Tæniæ were to be found; he visited it accordingly, and satisfied himself that the account was true, by taking out of its water bundles of dead Tape-worms coiled together. But what then? Did he find anything more? Yes, he found quantities of the intestines of fish which had been thrown in by the fishermen, which fairly accounted for the presence of the worms. (Rud. i. 373*.) No one who has been in the practice of examining the intestines of fishes in pursuit of their living contents, will be surprised at this account, since the quantity of tape-worm sometimes found in them is often almost incredible. Thus in a salmon of eleven pounds weight, in July, 1838, I found a number of *Bothriocephali*, the longest of which was four feet ten inches, and their united lengths amounted to upwards of fifty-nine feet. In the common Cod their number is often very great, and in a middle-sized turbot I have found upwards of two hundred specimens of the *Bothriocephalus punctatus*, each measuring from ten to eighteen inches in length.

It would be unnecessary to dwell longer on this subject, as I believe all Helminthologists, and all who have considered it, are fully agreed that the *Entozoa* have their natural abode in the animal body alone, and that in any other situation they infallibly perish. But the more difficult question is, *how do they get there*?

This query cannot at present be satisfactorily solved, for the truth is that we know nothing of their origin; but I am not inclined therefore to suppose them to be the entities of equivocal generation, a doctrine still indulged in by naturalists and physiologists of high name and authority, and which formerly was generally embraced with regard to all animals occupying the lower links in the great chain of animated being.

But as the light of science burned bright, innumerable errors were by slow degrees seen into, and have long since ceased to blot the page of truth. They arose out of ignorance; and to a similar origin we are, I believe, to attribute the theory of equivocal generation, whether it be applied to a fungus,

* At a place about a quarter of a mile beyond Belfast Bridge, on Ballymacarret Strand, where worn-out horses are slaughtered, I have more than once seen dead Tæniæ in a pool of water, but there could be no doubt that their original habitat had been the intestines of the slaughtered animals, dragged to the said pool by dogs, or kicked into it by idle boys.—J. L. D.

an animalcule, or an entozoon. We know not how a mucor originates on a decaying vegetable or animal matter, nor how millions of animalcules appear in a vegetable infusion, nor how an entozoon shows itself in the intestines or the brain of an animal; but because we do not in our present state of knowledge understand these things, are we to fall into the error of the ancients, and attempt to explain, by what seems next to an impossibility, their appearance on the supposition of a spontaneous generation? Some of these obscure animals have an organization so perfect and admirable, that to me it would seem almost as consonant to reason and sense to attribute the formation and œconomy of an elephant, or I might say, of man himself, to equivocal generation, as theirs.

To some, however, there seems to be no difficulty in the matter; and it is stated with great confidence, that because a clot of effused lymph from an inflamed serous surface becomes organized and sensible, so it is quite easy to conceive that a living worm may be equally produced from unorganized matter; the only difference between the two being this,—that the organized lymph continues adherent to the matrix, while the other is cast off as a separate being.

But that the analogy between an orgazined portion of lymph and an entozoon is extremely remote, can, I think, be easily shown; there is, indeed, a gap between them which can never be filled up. In the first place, the effused lymph in the example alluded to, however organized it may be, is a constituent, though I grant an unnecessary and superfluous part, of the body to which it is attached; but it is a natural product of that law of the animal œconomy, by which it throws out lymph from inflamed serous membranes, and from the sides of wounds, into which the vessels pullulate for the purpose of uniting the dissevered or adjacent surfaces. It is, in fact, a product of the adhesive action, or adhesive inflammation, as the common term is, and has no life whatever independently of the life of the part on which it is situated. However extraneous or unnecessary to the animal which has produced it, it has no vitality independent of the life of that animal of which it is now an integrant part, and its separation from which is its immediate death.

Again, I would remark, that no growth from effused lymph is ever seen showing any mark of independent life, or in the state of passing from a dependent to an independent vitality. No instance has ever occurred of effused lymph, however organized it may have become, exhibiting, as in the postic fictions of the animals formed from the mud of the Nile, one part as merely organized lymph, and another assuming the

form and functions of a worm. Nor further, has any entozoon been found in a semi-state of formation. There is never any intermediate stage in which it can be shown that the animal is in its transit from an accidental origin to the more perfect state, in which it shall exhibit a complex and independent organization, and like other animals, have organs for the continuation of its species. It would, indeed, require no inconsiderable stretch of imagination to conceive that a portion of effused lymph could assume to itself the power of producing other similar, or rather very dissimilar portions, which would propagate their kind from generation to generation, in *sæcula sæculorum*; for I incline to the belief that the *Tæniæ* and *Lumbrici* of Hippocrates were as much the progenitors of those found at the present day, as were the men and women of his time the ancestors of those now living in the nineteenth century.

In considering the formation of any animal, we cannot move a step without reference to an all-powerful architect; in every structural part, in every function, in every action, in every instinct of such animal, we perceive so great a degree of contrivance, creative power and wisdom, that the conviction is forced upon us that these cannot be the work of chance, that "there cannot be design without a designer; contrivance, without a contriver; order, without choice; arrangement, without anything capable of arranging; subserviency and relation to a purpose, without that which could intend a purpose; means suitable to an end, and executing their office in accomplishing that end, without the end ever having been contemplated, or the means accommodated to it*." Yet, in the doctrine of spontaneous generation all these are dispensed with; we have "contrivance without a contriver, and design without a designer," and a number of atoms collected together form themselves into wonderfully fabricated and sentient beings, independent of those conditions by which other organized bodies are produced. An insensible mass of matter will, we know, become developed into a living being of most complicated structure and wonderful œconomy; an egg will be hatched into a peacock, but the egg could never have existed but for its female parent, nor could it ever be hatched into the living bird without having received the permanent vital principle from its male progenitor, in obedience to those laws ordained by the Deity when the first male and female peacock were created; but the beings of equivocal generation are independent of all such laws; of the contrivance which they display

* Paley's Natural Theology.

they themselves are the contrivers, of the design the designers.

Let us then suppose that a portion either of effused lymph or extravasated blood, or any other substance, is about to go through the process of converting itself into an intestinal worm, and consider what it has to do to effect so complete a metamorphosis; we must suppose that before it assumed its independent and distinct life, the first object would be to form for itself a mouth and an alimentary canal for its future support, a gastric juice of course, and the other necessaries for the function of digestion; now even this, in a particle of matter destitute of mind or intelligence, as is the peacock's egg, would seem to border a little on the miraculous.

Well, then, having provided for what many consider the most important business of life, the eating function, what has it to do next? Why to shake off the homely and ungraceful form of its embryotic clot, and assume the elegant gracility of an ascarid, or a *Spiroptera*, or the broad and jointed amplitude of a tape-worm, the polymorphous structure of a *Scolex*, or the inextricable complexity of a *Distoma*.

Having settled this point, the clot has next to regulate its growth; clots are of very various dimensions, but the *Entozoa* are as certainly defined in their limits of magnitude as any other class of animals. Well, then, it must be obvious, that a clot larger than the species into which it is to be converted must fine itself down to the proper size, or if too small, plump itself up to the same; but by what mysterious power it can do this I profess not to understand.

Having got so far, however, in its own creation, what has it next to do? To cover itself with a proper skin; and in this great taste is often exhibited, the integument of many worms offering a very beautiful appearance; and observe the wonderful phænomenon connected with this. The Deity has spread over the surface of animals and plants (I mean such as He is acknowledged to have formed) an insensible covering, the cuticle, to serve as a protection for the parts beneath. And what does the clot do? Why just the same thing; it covers itself with a cuticle too; though indeed we need not wonder much at this, after its having made for itself an alimentary canal and bestowed upon it the function of digestion.

But the work is not yet completed; motion is not yet provided for, a muscular apparatus is therefore next to be fabricated; first, for the motion of the whole body, and next, for that of individual parts; and so perfectly is this accomplished, that it often forms a source of disappointment and vexation to the investigator of these animals. Some of the nematoid

worms roll themselves up so pertinaciously by the action of their longitudinal muscles, that it is with the utmost difficulty the ends of the animal can be so straightened as to be distinctly seen; and the muscles of the head and bothria in some species, as in several of the *Bothriocephali*, and particularly in the *Scolex polymorphus*, are in such perpetual activity, and cause so many changes of figure, that hours at the microscope are necessary before we can obtain a satisfactory knowledge of the structure of the head.

It so happens that some species have a much smaller muscular strength and activity than others, as, for instance, the *Echinorhynchi*; and these might be readily carried through the alimentary canal of the animal in which they reside, had they their muscular power alone to trust to. And how does the clot provide for this? It forms a trunk or proboscis of exquisite workmanship, which it arms on all sides with sharp horny hooks; it forms muscles for the especial purpose of pushing out this proboscis, and others for drawing it in at pleasure into a sheath specially provided for it; moreover, this proboscis is so fashioned that it can be inverted or everted upon itself, that is, it can be pushed out or retracted as a snail does its horn, without which second kind of motion it would be imperfect; and thus by its twofold motion and its armament of rigid hooks, the proboscis is harpooned into the mucous coat of the intestine at the pleasure of the worm, which latter is thereby secured from removal by the pressure of the passing contents of the bowel. Some species, not content with one proboscis, provide themselves with four, and these in some of the armed *Bothriocephali* present one of the most beautiful microscopic objects to be found in nature.

But the work is not yet complete; sensation is further wanted. We are to suppose, that as the animal has acquired a digestive apparatus, it has superadded to this the sense of taste; but at all events it has the sense of touch, and therefore has provided for itself a system of nerves; for without a nervous system in some form or another, none, I presume, will insist that there can be sensation. With regard to the sense of smelling I say nothing; and persons who consider such subjects, would perhaps be of opinion that the entozoic life would be as comfortable without as with that sense. But as respects seeing, since organs of vision would be altogether superfluous in habitats where midnight darkness holds perpetual reign, we find accordingly that in no instance have the *Entozoa* provided themselves with eyes.

Let us next suppose that the clot, which has thus so marvellously metamorphosed itself into an entozoon of admirable

structure, with its organic and animal life, its digestive, motive, and sensitive organs and functions, feels quite comfortable, and wishes to perpetuate its happiness in the continuation of its race or family to future individuals like itself, that it possesses the phrenological organ of philoprogenitiveness, —what will it do?

It will do this, what the Creator has done with the creatures formed by his own hand; it will provide itself with ovaries for containing eggs, the germs of future beings like itself; but how it is to form these, and how it is to impart to them the capability of being hatched into the identical resemblance of their parent, I pretend not to explain.

But we know that even when eggs are formed there is a very essential requisite necessary for bringing them into active life. They must have a certain vivifying power, without which they will remain as dead matter, and the fond hopes of the maternal parent will be frustrated unless this vital influence can somehow or other be procured. The task, then, next to be accomplished, is to provide this male influence; and we find that many species are androgynous, that is, the clot having produced its ovaries and ova, next fabricates organs for secreting the vivifying fluid, by whose presence the ova shall obtain the power of being developed into worms of the same formation and structure as their wonder-working parent.

Yet surprising as all this may appear, the climax is not yet arrived at. The *Ascarides* and some other genera are not androgynous or hermaphrodite, but distinctly male and female. Now on the principle of equivocal generation, it must be evident that the effused lymph or clot has the power of metamorphosing itself not only into a worm, but into a worm of either sex, as it may choose to determine; and it is equally obvious, that two clots must consult together in order to determine into what species they shall by mutual agreement become transformed. This must be absolutely necessary; there must be a predetermined arrangement between the two; for without this millions of males might be formed without one corresponding female, and millions of females be condemned to live and die in single blessedness.

These and many other wonders, or rather impossibilities, we must have recourse to, in order to support the theory of spontaneous generation; a theory which, in my mind, is as inconsistent with all that we observe of the operations of nature, as those which in the days of ignorance taught that putrid flesh of itself generated bees, that vapour influenced by an east wind changed into *Aphides*, and that the *Lepas anatifera* grew upon trees, and dropping into the sea became at length the barnacle goose.

And why should we have recourse to this theory of equivocal generation in order to account for the formation of the *Entozoa*? Precisely for the same reason that our progenitors indulged in the erroneous notions alluded to. They cherished the absurdity, because they were ignorant of the truth. They did not know that insect ova were hatched into maggots, and that maggots change into flies; and as the place of breeding of the barnacle was not known, they were determined to give it some origin, and they did so on grounds just as valid as those on which some modern physiologists rest the spontaneous origin of entozoic worms. The tentacula of the *Lepas* resemble feathers; why then should the shell not grow up to be a goose? An effused clot of lymph will become organized; why then should it not grow into a Tape-worm? The reasoning on the one side is just as good as on the other; but we may hope that a time will come when we shall have as direct proof of the origin of the entozoon as we have of that of the barnacle. At present, it is true, we are completely in the dark respecting the origin of worms in the interior of other animals; but it is better, more philosophical, more like genuine disciples of truth, to confess our ignorance, than to adopt a theory which is in direct opposition to what occurs in every department of organized nature with which we are properly acquainted.

For my own part, I can no more conceive that *Entozoa* are the creatures of chance than the animals they inhabit; though as to the manner of their origin, of which so little as yet is known, I pretend to go no further than is expressed in the old distich,—

> The things we know are neither strange nor rare,
> But wonder how the devil they got there.

Got there as they will, however, their possession of a distinct and independent life, their having sensation, voluntary motion, generative organs and functions, a digestive apparatus and other attributes of animals, while they exhibit the most minute, elaborate and exquisite workmanship, and also display the most unquestionable proofs of their whole composition, both general and partial, having been fabricated with the utmost wisdom and adaptation to their mode of life, show as clearly as if the proofs were written with a sunbeam, that they cannot be beings of fortuitous origin; that they are the offspring and work of the same Almighty hand which formed all the other races of animated being; and that to suppose their admirable formation to be the result of a kind of chance, is to impart to unintelligent matter that power and wisdom which belong only to the Deity himself.

XVI.—*Catalogue of the Land and Freshwater* Mollusca *of Ireland.* By Wm. Thompson, Vice-President of the Natural History Society of Belfast.

[Continued from p. 34.]

Gen. 5. Succinea, Drap.

1. *S. putris*, Flem., Jeff. Gray, Man. p. 178†.

S. amphibia, *Drap.* p. 58. pl. 3. f. 22; *Turt. Man.* p. 91.

Helix putris, *Linn. Mont.* p. 376. t. 16. f. 4.

Is generally distributed throughout Ireland. Specimens agreeing with the var. β. of Draparnaud—"major solidior, colore carneo"—in form (see pl. 3. f. 23.), colour, and more than ordinary thickness, though not in being larger than usual, are occasionally met with. The varieties γ‡ ("media magis elongata et colorata") and δ ("minor, apertura ovata") are found in the north. Individuals of this species, which adhere to stones in wet spots at a considerable elevation in the northern mountains, are, as may be expected, invariably much dwarfed in size.

2. *S. Pfeifferi*, Rossm. Gray, Man. p. 179. pl. 6. f. 74.*

S. gracilis, *Alder, Mag. Zool. and Bot.* vol. ii. p. 106.

S. Amphibia, b. *Pfeiffer*, p. 67. t. 3. f. 37.

Although less common than the last, this species or variety is widely diffused over the island—in the north it is not uncommon, and is here generally of the same amber colour as *S. amphibia*; as likewise are English specimens which I owe to the kindness of Mr. Alder; specimens of a reddish horn-colour, and much thicker than usual, have occasionally occurred to me in the north, and in quantity they have been obtained by Mrs. Patterson of Belfast, near Portarlington. Mr. Humphreys notices this shell under the name of *S. oblonga*, Turt., as found about Cork, and by this appellation Mr. Harvey mentions Ballitore (county Kildare) and Limerick as habitats, adding at the same time—"animal darker than in the last [*S. amphibia*], and found in far wetter places." From Finnoe (county Tipperary) I have been favoured by Mr. E. Waller with typical specimens of this *Succinea*, as admirably represented in Gray's Manual (f. 74*).

6. Bulimus§, Bruguiere.

1. *B. obscurus*, Drap. p. 74. pl. 4. f. 23; Gray, Man. p. 183. pl. 6. f. 63; Turt. Man. p. 81. f. 63.

Helix obscura, *Mull. Mont.* p. 391. t. 22. f. 5.

† Wood-cut, p. 178.—The coloured figure, pl. 6. f. 73, seems to me to partake as much of the form of *S. Pfeifferi* as of *S. putris.*

‡ This is probably *S. Pfeifferi.*

§ *Bulimus Lackamensis*, Flem. Gray, Man. p. 181. pl. 6. f. 62.
B. montanus, *Drap.* p. 74. pl. 4. f. 22; *Turt. Man.* p. 80. f. 62.
Helix Lackamensis, *Mont.* p. 394. t. 11. f. 3.
In Capt. Brown's 'Irish Testacea' this species appears under its original

This species is very local. In his 'Irish Testacea' Capt. Brown notices "one specimen [procured] on a dry mud wall near Clonooney," p. 529. About the roots of trees in the demesne of Woodlands near Dublin, I have, accompanied by Mr. R. Ball, obtained specimens, the shells of all of which, adult as well as immature, were like those sent me from other localities, and according to the observations of authors, covered with earth. From La Bergerie, Portarlington, I have been favoured with specimens by the Rev. B. J. Clarke. In March, 1837, it was supplied me in quantity from Larne, county Antrim, by Mr. James Manks. From the Falls of Clyde (Scotland), I have specimens collected by W. H. Harvey, Esq.

Animal, rather dark grey above, lighter towards the disk, and when viewed under a lens appearing closely marked all over the back and sides, with darker spots and markings so disposed as to render it very beautiful; disk very pale grey. Tentacula cylindrical, stout, and club-shaped; the upper of ordinary length, the lower short.

2. *B. acutus*, "Brug." Drap. p. 77. pl. 4. f. 29, 30; Gray, Man. p. 185. pl. 6. f. 67.

B. fasciatus, *Turt. Man.* p. 84. f. 67.

Turbo fasciatus, *Penn. Mont.* p. 346. t. 22. f. 1.

This is a local species, but found from north to south—from the neighbourhood of the Giant's Causeway to Youghal. It is especially common on marine sand-banks and pastures, but in remote inland localities is likewise native. It would seem to be more common to the eastern than the western portion of the island, but in the latter it has occurred to me about Ballyshannon, county of Donegal. I have occasionally observed this species inhabiting the crevices of walls at a considerable height, as those of Howth church, county Dublin. M. Michaud remarked on some Irish specimens of this most variable species which I contributed to his collection, that they were the *B. articulatus*, Lam.

3. *B.*† *lubricus*, "Brug." Drap. p. 75. pl. 4. f. 24; Turt. Man. p. 82. f. 65.

name, as last quoted, but no locality is assigned to it. Having written to Capt Brown on the subject, he very kindly supplied me with the following note under date of April 9, 1840:—"I found the *Bulimus montanus* on the sloping banks below an old castle about four miles from Maryborough, Queen's county, the name of which I cannot remember: it is, however, on the road between Maryborough and Stradbally. I also found it on a limestone gravel ridge near Maryborough, not a mile distant. I afterwards met with it among debris on the mountains of Mourne, close to the sea-shore." As *B. Lackamensis* and *B. obscurus* differ little from each other, except in size, and as the period when the localities just alluded to were visited by this author is now so far distant, it would seem to me, judging from other circumstances connected with the species, that a large variety of *B. obscurus* may not improbably be the shell thus referred to.

† In ignorance of the generic name—*Cionella*, Jeffreys; *Achatina*, Alder; *Zua*, Leach, as adopted by Gray, which this species should properly bear,—I use the older appellation of *Bulimus*.

Zua lubrica, *Gray, Man.* p. 188. pl. 6. f. 65.

Helix lubrica, *Mull. Mont.* p. 390. t. 22. fig. [illegible]ot good.

Is common, and generally distributed over Ireland. From under stones on the dry mountain side at Wolfhill, near Belfast, and on sea-side pastures I have obtained a few specimens of a handsome variety, of a pale grey colour and transparent, with a white peristome; in such localities this shell does not present to the same degree the rich amber colour and brilliant polish which it does in woods or shady places. The animal is blackish. From an examination of the food contained in seven Starlings (*Sturnus vulgaris*), shot at different places in the north of Ireland, from the month of December to March, during a mild winter, it would appear either that the *B. lubricus* is a special favourite, or that its haunts are similar to those of the bird; as six of the Starlings, in addition to *Helices* and other food, contained specimens of this shell varying from five to thirteen in number.

7. Achatina, Lam.

1. *A. Acicula*, Lam. Gray, Man. p. 191. pl. 6. f. 71; Turt. Man. p. 89. f. 71.

Bulimus Acicula, *Drap.* p. 75. pl. 4. f. 25, 26.

Buccinum terrestre, *Mont.* p. 248. t. 8. f. 3.

This handsome species is found sparingly, but from east to west, in the more southern half of Ireland. Mr. W. H. Harvey has procured it on the "sand-hills, Miltown Malbay, and from under stones near Limerick," but in the latter locality marks it as "very rare." Mr. T. W. Warren of Dublin, has supplied me with specimens procured by him on different occasions in the rejectamenta of the river Dodder near that city. At La Bergerie (Queen's-county), it is found by the Rev. B. J. Clarke; and at Finnoe (county Tipperary), by Mr. Edw. Waller; by Miss Ball at Castle-martyr demesne (county Cork); and by Miss M. Ball at Dromana (county Waterford).

For the *Cionella elongata*, Jeff. noticed with doubt as Irish by Mr. Jeffreys, Linn. Trans. vol. xvi. p. 348. see Gray's Manual, p. 18. under *Achatina octona*.

8. Pupa, Lam.

1. *P. umbilicata*, Drap. p. 62. pl. 3. f. 39, 40; Gray, Man. p. 193. pl. 7. f. 78; Turt. Man. p. 97. f. 78.

Turbo muscorum, *Mont.* p. 335. t. 22. f. 3.

This is one of the most common of the testaceous Mollusca throughout Ireland and her islands, and especially abundant where limestone and chalk prevail. From the sea-shore to a great elevation in the mountains it is found†. It is subject to considerable va-

† Mr. Alder, with reference to Newcastle-upon-Tyne, remarks of this species—"under stones, common; seldom in moss" (Newc. Trans. vol. i. p. 33); in Ireland it is common among mosses and lichens in suitable localities.

riety in form and colour; the toothless var. not unfrequently occurs, and on a sea-bank at Belfast Bay I once obtained a specimen with two teeth†, but differing in no other respect from the ordinary shell, I cannot consider it otherwise than an accidental variety of *P. umbilicata*. Specimens whitish and opake, like "dead shells," not unfrequently occur containing the living animal. Occasionally in the north, at the South Islands of Arran, and about the lakes of Killarney, I have procured a few individuals of a crystalline transparency, the elegance of their appearance being much enhanced by the pure white margin of the peristome. The animal is of a very pale grey colour.

2. *Pupa Anglica*, Alder. Gray, Man. p. 195. pl. 7. f. 82.
Vertigo Anglica, *Fer. Turt. Man.* p. 102. f. 82.

This species, considered peculiar to England when described by Ferussac, and in the very latest work treating of the British land Mollusca having only the localities—"north of England, Northumberland, Lancashire," attributed to it, is found in the north and south, in the east and west of Ireland; but at the same time is by no means general, or, except in particular spots, plentiful, like *P. umbilicata*. Under stones, on marsh plants, in wet moss, &c. it harbours. I first met with it in June, 1833, in the county of Londonderry, at the side of the river Bann near its junction with the ocean; in numerous localities throughout Down and Antrim, and in the demesne of Florence-court, county Fermanagh, it since occurred to me; in the west on the mountain of Benbulben in Sligo; in the south about O'Sullivan's cascade, at the lower lake of Killarney; and in the east in the Glen of the Downs, county Wicklow. Mr. W. H. Harvey obtained this species "near Ballitore and on the sand-hills, Miltown Malbay," but notes it as very rare. In the collections of Mr. T. W. Warren and Mr. Edw. Waller of Dublin, are specimens procured by the former gentleman at Ardmore (county Waterford), and in the neighbourhood of the metropolis; and by the latter at Annahoe, county Tyrone—near Portarlington it is found by the Rev. B. J. Clarke, and by the Rev. T. Hincks near Cork, where it is "abundant in wet moss." In England I have collected the *P. Anglica* at Twizel House, Northumberland; in Scotland about Ballantrae, Ayrshire.

The shells of this *Pupa* commonly vary in colour from pale greyish brown to a deep reddish shade of this colour, and are rarely of a glassy transparency: the margin of the mouth and teeth are generally of the colour of the shell, but sometimes pure white. Mr. Gray having had the opportunity of consulting the work only of M. Michaud, refers his *Pupa tridentalis* with doubt to this species, but from having been favoured by its describer with specimens of this shell from the neighbourhood of Lyons, I can state with certainty that it is en-

† Capt. Brown, in his 'Illustrations,' &c. quoting Pfeiffer, notices his *P. bidentatus* as a Portmarnock shell. My specimen is not identical with what Pfeiffer figures. Rossmassler does not consider *P. bidentatus* distinct from *P. marginata*. See Rossm. Part I. p. 83; and Gray, Man. p. 197.

tirely distinct from *P. Anglica*, and a species unknown as British. Mr. Gray makes Pfeiffer's *Pupa bidentata*, 1. 59. t. 3. f. 21, 22, synonymous with *P. Anglica*, but judging from the diagnosis and figures I cannot think them the same.

3. *Pupa marginata*, Drap. p. 61. pl. 3. f. 36—38; Gray, Man. p. 196. pl. 7. f. 79†; Turt. Man. p. 98. f. 79.

Is common, and although not generally diffused, is found from the extreme north to south, and east to west of Ireland. It is particularly partial to the sand-hills or pastures bordering the coast, and to marine islets, as those in Strangford lough—in the inland parts of the country it likewise occurs. The tooth is rarely visible: specimens containing the living animal are not unfrequently of a whitish colour‡.

9. Vertigo, Müller.

1. *V. edentula*, Alder. Gray, Man. p. 199. pl. 7. f. 80; Rossmassler, x. p. 28. tab. 49. f. 646.

Pupa edentula, Drap. p. 59. pl. 3. f. 28, 29; Turt. Man. p. 99. f. 80.

This species is found from north to south of Ireland. Since September, 1832, I have met with it in numerous localities throughout the counties of Down and Antrim, at the Glen of the Downs in Wicklow, and in shell-sand from Portmarnock (county Dublin). Annahoe, county Tyrone, Mr. E. Waller—La Bergerie, Queen's-county, Mrs. Patterson (of Belfast)—neighbourhood of Cork, Rev. T. Hincks. The typical form of *V. edentula* I generally find under stones; the elongated and cylindrical variety in woods—in autumn and winter this latter is most readily obtained on the fallen leaves of trees; in summer, on the under side of the fronds of ferns (*Aspidii*, &c.), the shell and plant, though the naturalist only will perceive the former, being in beauty equally attractive. This elongate variety has seven and occasionally even eight volutions, and attains the length of $1\frac{1}{2}$ line: when of this size, the animal §, so very minute relatively to the shell, has a grotesque appearance when bearing this along, which is carried singularly erect, not more out of the perpendicular than the leaning tower at Pisa! This variety, judging from descrip-

† The larger wood-cut at p. 197, representing this species magnified, is the most characteristic in the work. Rossmassler's figure 323 is particularly good.

‡ *Pupa juniperi*, Alder. Gray, Man. p. 197. pl. 7. f. 81.—Turbo juniperi, Mont. p. 340. t. 12. f. 12.
P. Secale, Drap. p. 64. pl. 3. f. 49, 50.—Vertigo Secale, Turt. Man. p. 101. f. 81.
In a list of additions to the Irish Fauna published in the Lond. and Edin. Phil. Mag. 1834, p. 300, this species was enumerated in consequence of my having been assured that specimens which I saw in a Dublin collection were found in this country—their owner now believes that they must have been brought from England.

§ When adult, the animal varies in colour from greyish-white to blackish-grey.

tion and figures, is perhaps the *Pupa inornata*, Michaud, Comp. p 63. pl. 15. f. 31, 32, apparently differing from it only in size—it is described to be two lines in length: my largest specimen is $1\frac{1}{2}$ line, but this discrepancy is not greater than might be anticipated between individuals obtained in the north of Ireland and at Lyons, where the *P. inornata* was discovered. I at first thought this var. might be *Pupa muscorum*, Drap. (Phil. Mag. 1834, p. 300.), but specimens of this shell from Montpellier, since sent me by M. Michaud, prove that it is not so—these are identical with examples of *Pupa cylindrica*, which I have collected at Salisbury Craigs near Edinburgh, a locality in which this rare species was discovered by Mr. E. Forbes.

2. *Vertigo pygmæa*, Fer. Gray, Man. p. 201. pl. 7. f. 83; Turt. Man. p. 103. f. 83.

Pupa pygmæa, *Drap.* p. 60. pl. 3. f. 30, 31.

This is the most widely distributed species of *Vertigo* over Ireland, occurring throughout the country. It is generally found but sparingly where it does prevail, and is most easily procured under stones, both in dry and wet situations, from the sea-shore to a high elevation in the mountains. The usual number of teeth is four, of which one is central on the upper or body portion.—On a sea-bank, Belfast bay, I once met with a *Vertigo* resembling the ordinary *V. pygmæa* in every respect, but with the addition of a tubercle, about the size of one of the teeth, placed *outside* the mouth and near the junction of the outer lip with the body volution. Animal dark lead colour, or rather blackish-gray above, disk blackish-gray anteriorly, becoming suddenly paler, so as to be nearly white at the opposite extremity.

3. *Vertigo substriata*, Alder. Gray, Man. p. 202. pl. 7. f. 84.

V. sexdentata, *Turt. Man.* p. 103. f. 84.

This species, though rare, has a wide distribution in Ireland. In the glen at Holywood House (county Down), I obtained specimens in 1832, and subsequently in shell-sand from Portmarnock (county Dublin). Mr. W. H. Harvey gives as habitats "Miltown Malbay, and near Limerick—rare at Ballitore (county Kildare)." In the neighbourhood of Ballantrae, Ayrshire, this *Vertigo* has occurred to me. Reference alone to Montagu's specimens would seem to prove whether his *Turbo sexdentata*, p. 337, be this species, as his description is partly applicable to this (in number of teeth), and partly to *V. palustris* (in being smooth)—the locality in which it was found would be more suitable to the latter: the figure in 'Testacea Britannica,' throws no light upon the subject.

4. *Vertigo palustris*, Leach. Gray, Man. p. 204. pl. 7. f. 85; Turt. Man. p. 104. f. 85.

V. septemdentata, "*Fer.*" *Rossm. Icon.* x. p. 28. tab. 49. f. 647.

In numerous localities throughout the counties of Down and Antrim I have since 1832 procured this well-marked species, which,

as its name denotes, is an inhabitant of the marsh: it nevertheless seems invariably to be not only free from dirt, but presents a high polish. By the Rev. B. J. Clarke the *V. palustris* has been obtained near Portarlington, and by Mr. Edw. Waller at Finnoe, Tipperary. In England I have procured it near Twizel, Northumberland, and in Scotland in several localities around Ballantrae. Mr. Gray, in the Introduction to his edition of Turton's Manual, mentions the *V. palustris* and *V. angustior* to "have been only yet recorded as found near London and in the west of England," p. 37—in 1834 I published both species as indigenous to Ireland. Phil. Mag. 1834, p. 300. Reference to this communication, though a mere list of species of land and freshwater Mollusca previously unrecorded as Irish, would have shown that several species noticed in the Manual as local, have a considerable range of distribution.

5. *Vertigo pusilla*, "Müll." Jeffreys, Linn. Trans. vol. xvi. p. 361. Gray, Man. p. 205. pl. 7. f. 86.

V. heterostropha, *Leach. Turt. Man.* p. 105. f. 86.

Pupa Vertigo, *Drap.* p. 61. pl. 3. f. 34, 35.

Is very rare, but has been found in the north-east and west of the island. From under a stone on a dry bank in Colin Glen, near Belfast, I obtained a specimen in 1832, as Mr. Hyndman did in an adjacent glen some time afterwards; in shell-sand from Portmarnock I have detected it, and Mr. Harvey has supplied me with a specimen from Miltown Malbay, where he states the species is very rare. A shell from Flanders, favoured me by M. Michaud, under the name of "*Pupa Vertigo*, Drap. (*Vert. pusilla*, Mich.)," is identical with that under consideration.

6. *Vertigo angustior*, Jeffreys. Linn. Trans. vol. xvi. p. 361; Gray, Man. p. 205.

Turbo Vertigo, *Mont.* p. 363. t. 12. f. 6.

In 1833 I was favoured by Mr. W. H. Harvey with specimens of *Vertigo* labelled "*V. heterostropha, two species*, from the sand-hills Miltown Malbay, the smaller common, the larger very rare." The smaller are of this species, which has always seemed to me distinct from the *V. heterostropha* of Drap. and of Turton's Manual. A comparison of Montagu's *Turbo Vertigo* (tab. 12. f. 6.) with the *V. heterostropha* in the works just mentioned, will show the obvious difference. To Mr. Jeffreys the merit is due of clearly distinguishing these species. Since 1834, when this *Vertigo* was published as indigenous to Ireland, I have not obtained any more information respecting it.

10. Balæa, Gray.

1. *B. perversa*, Flem. Gray, Man. p. 207. pl. 6. f. 70.

B. fragilis, *Gray. Turt. Man.* p. 87. f. 70.

Pupa fragilis, *Drap.* p. 68. pl. 4. f. 4.

Turbo perversus, *Mont.* p. 355. t. 11. f. 12.

This species is generally distributed over the island. Its favourite

abode is on the stems and branches of trees, where it shelters itself beneath the loose bark or in its crevices; and on trees whose bark from smoothness will not afford it shelter, this *Balæa* lurks in the mosses and lichens which adorn them—in the tufts of these cryptogamous plants I have remarked it buried, whilst the *Vertigo edentula* displayed itself at the outside.

11. Clausilia, Drap.

1. *C. bidens*, Drap. p. 68. pl. 4. f. 5—7; Gray, Man. p. 212. pl. 5. f. 53.

C. laminata, *Turt. Man.* p. 70. f. 53.

Turbo laminatus, *Mont.* p. 359. t. 11. f. 4.

Is a rare and local species in Ireland. The first native specimens I have seen were in the collection of Mr. T. W. Warren of Dublin, who had procured them in Belamont Forest near Coothill, county Cavan. In Sept. 1837 I had the gratification of seeing numbers of this fine *Clausilia*, after heavy rain ascending the stems of stately trees in the demesne of Florence Court, county Fermanagh, the seat of the Earl of Enniskillen. At Dovedale, in Derbyshire, I have met with it.

2. *Clausilia nigricans*, Jeffreys. Gray, Man. p. 217. pl. 5. f. 58.

C. rugosa, *Drap.* p. 73. pl. 4. f. 19, 20; *Turt. Man.* p. 74. f. 58.

Turbo bidens, *Mont.* p. 357. t. 11. f. 7.

Is very commonly distributed over Ireland and the surrounding islands. It is an extremely variable species in being more or less ventricose, in the striæ being obscure or prominent, in the form of the mouth, and occasionally even in the number of internal lamellæ—the largest specimen I have found in the neighbourhood of Belfast is 7½ lines in length, and has thirteen volutions; several others of the usual length of 6 lines have likewise this number. The colour commonly varies from a very pale greyish-white to deep reddish-brown; very rarely specimens of a glassy transparency occur, and in such of these as I have found, the animal was equally colourless. To Mr. Gray, Mr. Alder, and Mr. Forbes, I have shown the specimens differing as here described, and they agree with me that they must all be considered *C. nigricans*†.

Fam. 4. "Auriculadæ."

Gen. 1. Carychium, Müller.

1. *C. minimum*, Müll. Gray, Man. p. 221. pl. 7. f. 77; Turt. Man. p. 96. f. 77.

Auricula minima, *Drap.* p. 57. pl. 3. f. 18, 19.

Turbo Carychium, *Mont.* p. 339. t. 22. f. 2.

This minute species is commonly distributed over Ireland, and

† Since the above was written the fine work of Rossmassler has been consulted, in which numerous varieties of *C. nigricans* or "*C. rugosa*" are admirably represented. Icon. part 7. p. 23. fig. 477—487. The *C. obtusa*, Pfeiffer, which is common in Ireland, is here included (and judiciously I consider) as a var. of *C. rugosa*.

may be found in moss, on decaying leaves and wood, under stones, &c., in dry as well as wet places, though the latter are its favourite abode—in the north of the island specimens rarely attain one line in length.

Gen. 2. Acme, Hartmann.

1. *A. fusca*, Gray, Man. p. 223. pl. 6. f. 66.
   Auricula lineata, *Drap.* p. 57. pl. 3. f. 20, 21.
   Bulimus lineatus, *Turt. Man.* p. 83. f. 66.
   Turbo fuscus, *Boys and Walker. Mont.* p. 330.

Is rare in Ireland, but is widely distributed, being found over the island. Mr. W. H. Harvey was the first to find and distinguish this species as a native—he notes it as not uncommon on the sand-hills in Miltown Malbay, where in 1826 he procured both the ordinary form and the variety with the spires reversed. This shell has been procured by Mr. Hyndman and myself in various localities in the counties of Down and Antrim, but not more than three or four individuals have been obtained on any one occasion. I have more than once found this shell, containing the living animal, under stones on bare clayey banks, in which situations the only other mollusk met with was *Helix chrystallina*. At Annahoe (county Tyrone), Mr. Edw. Waller has obtained the *A. fusca* (both a. and b. Turton, p. 83.); as Mr. T. W. Warren has done in the neighbourhood of Dublin, and the Rev. B. J. Clarke at La Bergerie, Queen's county. The Rev. T. Hincks of Cork, favours me with two southern habitats—Ballinhassig Glen (county Cork) and near Mucruss, Killarney (county Kerry).

Fam. 5. Limnæadæ, Jeffreys.

Gen. 1. Limnetis, Drap.

1. *L. auricularius*, Drap. p. 49. pl. 2. f. 28, 29, 32; Gray, Man. p. 232. pl. 9. f. 100; Turt. Man. p. 117. f. 100; Rossm. Icon. 1. 98. t. 2. f. 55.
   Helix auricularia, *Mont.* p. 375. t. 16. f. 2.

Through deference to those who have paid much more attention to the subject than myself, I note this *Limneus* under the head of a distinct species, although I am disposed to believe that it is only an extreme form of *L. peregeri*. The *L. auricularius*, as figured in both editions of Turton's Manual, and by Draparnaud, is not very unfrequent in Ireland, but of the extremely expanded form represented by Rossmassler is very rare, and from one or two still ponds only, abounding in subaquatic plants of various species, have I seen it. Pfeiffer's figure (part 1. t. 4. f. 17, 18.) is somewhat intermediate between those just mentioned, and corresponding to it I have procured specimens. All forms, from the ordinary *L. peregeri* to the *L. auricularius*, it seems to me may be closely traced blending into each other—reference to the figures in many works will be found to present various forms, though in all the aperture is greatly expanded. Some specimens of *L. auricularius*, which I collected in Stow Pool,

Lichfield, in July, 1836, are more distinct than any which I have seen represented; the spire is more minute, and the upper part of the outer lip goes off from the body of the shell in the form of a straight line; but of all the individuals obtained on this occasion no two are precisely alike, but vary from the extreme form described to the *L. ovatus*, Drap.

2. *Limneus peregер*, Drap. p. 50. pl. 2. f. 34—37; Gray, Man. p. 233. pl. 9. f. 101†; Turt. Man. p. 118. f. 101. A very rare form.

Helix peregra, *Mont.* p. 373. t. 16. f. 3.

This species, presenting endless variety, is abundant throughout the waters of Ireland, from the smallest drain to the vast expanse of Lough Neagh. Some of the forms which have been considered as distinct species may be enumerated as occurring in this country, as *L. ovatus*, Drap., *L. intermedia*, Michaud (Comp. pl. 16. f. 17, 18.), *L. marginata*, Mich. (Id. f. 15, 16.), *L. lineatus*, Bean, *L. acutus*, Jeffreys—of these two last I judge from comparison of authentic specimens, the former favoured me by Mr. Alder, the latter by their describer. One variety seems to require especial notice—the *Gulnaria lacustris*, Leach. On the shores of Loughs Neagh and Earn I have collected specimens identical with those so named by Dr. Leach in the British Museum, and which are from the lakes of Cumberland—their donor General Bingham. It would seem to be the same form which Capt. Brown figures under the name of "Lymnæa lacustris, Brown's MSS.," and states to have been found by him in Loch Leven, Kinross-shire. Illustrations Brit. Conch., pl. 42. f. 24, 25. From lakes in various parts of Ireland I possess this form, which, from its extreme delicacy, I look upon as an inhabitant of still water, and from its rare occurrence, except when cast ashore, of deep water also. The specimens, which containing the living animal, have occasionally been found in shallow water, have I presume been driven thence in storms, to which conclusion I am led by having once at Lough Earn, and frequently at Lough Neagh, looked in vain for a living individual with a shell of this form at the edge of their waters, though plenty of the more common forms of *L. peregер* were there. The variety under consideration is intermediate in form between the typical *L. peregер* and *L. glutinosus*, with a short spire and ample aperture; shell very thin, longitudinally striated; striæ regular, frequent, and strongly marked; about one in thirty of the specimens examined somewhat spirally cut, "like the facets of glass"; slight fold on the pillar lip; an epidermis-like covering, of a dull greenish-yellow colour. By the chief cultivators of this branch of natural history in Great Britain, to whom I have sent this shell, it was considered a particularly well-marked variety‡, and M.

† The wood-cut at p. 235 is much more characteristic than figure 101, which is that of the first edition repeated. I have shells similar to f. 101, from the vicinity of Belfast.

‡ Mr. Gray remarks—"The *Gulnaria lacustris* of Leach is very peculiar, from the erosion of its tips, probably arising from its locality, the lakes of

Michaud, in acknowledging the receipt of specimens from Lough Neagh, remarked that the form was unknown to him in France.

I have seen the *L. peregeri* attached in numbers to the backs of turtles, kept in a pond at Fort William, near Belfast, when it was amusing to observe these animals swimming about, with the *Limnei* still keeping "their seats" upon them.

3. *Limnæus involutus*, Harvey.

Amphipeplea involuta, *Gray, Man.* p. 245. pl. 12. f. 147.

This *Limnæus* so remarkable in form was discovered by Wm. H. Harvey, Esq. in a small lake on Cromaghaun Mountain near the lakes of Killarney. A description of it will be found in the Annals Nat. Hist. for March 1840, p. 22. Its specific character is—spire sunk within the outer whorl; aperture very large, extending to the apex.

4. *Limnæus stagnalis*, Drap. p. 51. pl. 2. f. 38, 39; Gray, Man. p. 236. pl. 9. f. 104; Turt. Man. p. 121. f. 104; Rossm. f. 49.

Helix stagnalis, *Mont.* p. 367. t. 16. f. 8.

This, the largest European *Limnæus*, though by no means generally distributed, occurs in every portion of the island. It differs very much in size, according to locality; mature specimens, which I have found in the cold water of Lough Neagh, where barren of subaquatic plants, did not exceed one inch in length, whereas in drains in which such plants abound, they attain double this size.

A *Limnæus* collected by my friend Richard Laugtry, Esq., of Fort William, near Belfast, when on a tour through Upper Canada in 1835, seems identical with *L. stagnalis*. It differs from the ordinary form only in tapering rather more towards the apex, and in the second largest volution being a little more tumid; but in these respects an extensive series of Irish specimens before me differ very much. The American specimens were taken in the river connecting Buckhorn with Pigeon Lake.

5. *Limnæus palustris*, Drap. p. 52. pl. 2. f. 40—42. and pl. 3. f. 1, 2; Gray, Man. p. 239. pl. 9. f. 107; Turt. Man. p. 123. f. 107; Rossm. f. 51, 52.

Helix palustris, *Mont.* p. 370. t. 16. f. 10.

Common, and generally distributed over Ireland—in size, form, and colour very variable. In the river Bann, near Kilrea, I have procured specimens of the ordinary colour, but with the addition of spiral narrow white bands—in some waters the different species of *Limnei*, &c., are so marked. A shell differing from the *L. palustris* in general proportion (being much shorter relatively to its breadth) and in colour (generally of a uniform pale yellow), is common to

Cumberland." Manual, p. 236. This erosion is but too common in the specimens I have collected in Ireland, but was always attributed by me simply to the progress of decay, the shells having for some time been exposed on the beach. When the tips were eroded the shells always presented other marks of decay.

Lough Neagh and other lakes in Ireland: it is found attached to stones at the edge of the water, and where the adjacent bottom is stony, with very little vegetation—under similar circumstances it has also occurred to me in the first-named locality. It is identical with the var. β. of Mr. Jeffreys, who has favoured me with specimens from Battersea, near London. The small size, different colour, and freedom from all adventitious matter, I should be disposed to attribute to the colder water and less food in such localities, than in the ponds and ditches, in which the ordinary form prevails.

6. *Limneus truncatulus*, Jeffreys. Gray, Man. p. 240. pl. 9. f. 108.
   L. minutus, *Drap.* p. 53. pl. 3. f. 5—7.
   L. fossarius, *Turt. Man.* p. 124. f. 108.
   Helix fossaria, *Mont.* p. 372. t. 16. f. 9.

Is generally distributed over Ireland. It inhabits drains, ditches, &c., like the *L. palustris*; but in moist spots, and about springs, at a considerable elevation in the northern mountains†, is likewise found, and is here always of a very small size. In July, 1833, when accompanied by Mr. Hyndman, I remarked many of this species alive, and adhering to stones which lay dry upon the shore of Lough Neagh, far above the summer level of its waters‡—these were of uniform size, very small, and when containing the living animal, of a very dark reddish brown colour. Many varieties of the *L. truncatulus* have occurred to me in Ireland; among them was one very much elongated, and another with regular longitudinal striæ, the latter of which is well remarked by Dr. Turton, to be "very elegant." Man. p. 125.

7. *Limneus glaber*, Gray, Man. p. 242. pl. 9. f. 106.
   Limneus elongatus, *Drap.* p. 53. pl. 3. f. 3, 4: *Turt. Man.* p. 122. f. 106.
   Helix octanfracta, *Mont.* p. 396. t. 11. f. 8.

I have not seen any Irish specimens of this *Limneus*, which is thus noticed in the supplement to Mr. Jeffreys's paper in the Linnean Transactions, vol. 16. p. 520: "Ireland, Rev. James Bulwer." On inquiry of Mr. Bulwer, he stated that the shell so noticed was considered by him but a variety of *L. palustris*. By a letter from Mr. Jeffreys, dated June 8, 1840, I learn that "*L. elongatus* was mentioned as Irish on the authority of the late Dr. Goodall, who stated that he had received specimens from Mr. Bulwer." Mr. Jeffreys adds, "I have, however, two or three undoubted specimens among a collection of Irish shells, which I purchased about three months ago from Mr. John Humphreys of Cork—the tray which contained them was labelled 'Cork.'" From Mr. Humphreys I learn that he

† In such places it is preyed on by the Lapwing (*Vanellus cristatus*), from whose stomach I have taken it.

‡ Montagu has, on the contrary, remarked that when left dry the animal perishes. Test. Brit., p. 372.

had not identified the species, but that the note of locality appended to the shells alluded to by Mr. Jeffreys was strictly correct †.

2. Ancylus. "Geoffroy."

1. *A. fluviatilis*, Mull. Drap. p. 48. pl. 2. f. 23, 24; Gray, Man. p. 249. pl. 10. f. 125; Turt. Man. p. 140. f. 125.

Patella fluviatilis, *Mont.* p. 482.

This species is distributed over the island, and is equally found attached to stones in the mountain torrent, the river, and the still waters of the lake. The var. described by Montagu (p. 483.) as being strongly striated, and by Jeffreys (p. 390.) as being pellucid, &c., I find upon the first stones wet by mountain springs, on their gushing from the earth. All the specimens from these localities are much smaller than those found in still water, and coated with green vegetable matter, which is entirely adventitious, and may be seen in like manner coating the little prominences of the stone to which the *Ancylus* adheres—this and the animal being removed, the shell is crystalline. Under the name of "*Ancy. fluviatilis*, Drap. var. montana," M. Michaud has favoured me with specimens from the Pyrenees, quite identical with the var. just noticed, as it need hardly be remarked are others from France with the ordinary form.

I had often observed that beautiful and graceful bird, the Gray Wagtail (*Motacilla boarula*), feeding about the mountain springs, but was not aware of its propensity for mollusca, until on opening the stomach of one without knowing where the specimen had been killed, I found it to be filled with shells of this species, all of which being of the var. *a.*, afforded evidence whence they had been procured.

Animal blueish-gray beneath; portion which comes in contact with the shell blackish-green - of six specimens, which I once kept in a dry chip box for eighteen hours, two perfectly recovered on being immersed in water.

2. *Ancylus lacustris*, Mull. Drap. p. 47. pl. 2. f. 26, 27; Turt. Man. p. 141. f. 126.

Velletia lacustris, *Gray, Man.* p. 259. pl. 10. f. 126.

Patella lacustris, *Mont.* p. 484.

This species, although rare, has been met with in the north, east, and west of Ireland, in still and gently flowing waters. It was noticed by Captain Brown in his 'Irish Testacea' as "plentiful in a mill-race a mile below Naas." By the late Mr. Templeton's MS. I find that the species had been previously observed by him "on

† *Limnæus glutinosus—Amphipeplea glutinosa.*

Is enumerated in Turton's 'Catalogue of Irish Shells,' but without any locality being named. Mr. Gray notes it as found "in stagnant ditches, England, Ireland." Man. p. 241.—Mr. Gray informs me that he mentioned the species as Irish from specimens sent to the British Museum many years ago, by a gentleman then resident in Ireland, and who had contributed a number of species from this country to that collection; but of the *L. glutinosus* having been one of those so derived there is now no certain record.

Potamogeton, &c., in the drains of the bog-meadows near Belfast." Between the fourth and fifth locks of the Lagan canal, a few miles from this town, I have, at the end of September, procured many specimens, all of which were on the under side of the leaves of the yellow water-lily (*Nuphar lutea*) and great water-plantain (*Alisma Plantago*)—Pond in the demesne at Moira, county Down, Mr. Hyndman—Near Limerick, Mr. W. H. Harvey—Beechwood, near Portmarnock, county Dublin, Mr. T. W. Warren—Glasnevin Botanic Garden, Dublin, Dr. Coulter—Finnoe, county Tipperary, Mr. Edward Waller.

3. Physa, Drap.

1. *P. fontinalis*, Drap. p. 54. pl. 3. f. 8, 9; Gray, Man. p. 251. pl. 9. f. 110; Turt. Man. p. 127. f. 110.

Bulla fontinalis, *Mont.* p. 226.

Is common, and generally distributed over Ireland, occurring on aquatic plants in stagnant and gently flowing water. It is subject to considerable variety.

2. *P. hypnorum*, Drap. p. 55. pl. 3. f. 12, 13; Turt. Man. p. 128. f. 113.

Aplexus hypnorum, *Flem.*; *Gray. Man.* p. 255. pl. 9. f. 113.

Bulla hypnorum, *Mont.* p. 228.

Although much less common than *P. fontinalis*, is generally diffused over the island, and found as frequently in very shallow, as in deep water.

4. Planorbis, Muller.

1. *P. corneus*, Drap. p. 43. pl. 1. f. 42—44; Gray, Man. p. 258. pl. 8. f. 95; Turt. Man. p. 112. f. 95.

Helix cornea, *Mont.* p. 448.

Has been found only within a very limited portion of the island. It still prevails in the locality recorded by Capt. Brown—near Maynooth, in the county of Kildare. From about Naas in the same county I have been supplied with specimens by Mr. R. Ball; and by the Rev. B. J. Clarke, with some obtained by him near Lea Castle, Queen's county.

2. *Planorbis albus*, Mull. Gray, Man. p. 259. pl. 8. f. 97; Turt. Man. p. 114. f. 97.

P. hispidus, *Drap.* p. 43. pl. 1. f. 45—47.

Helix alba, *Mont.* p. 459. t. 25. f. 7.

Prevails generally over Ireland. Specimens of *P. glaber*, Jeffreys, which I owe to the kindness of their describer, seem to me (as to Mr. Alder) identical with *P. albus*.

3. *Planorbis lævis*, Alder. Gray, Man. p. 261. pl. 12. f. 148.

Is found in the north-east of the island. Early in the winter of 1832 I obtained a number of this species on aquatic plants (especially *Callitriche aquatica*), with *P. imbricatus*, in a small pond at

the Falls, near Belfast, and about the same time procured others in the rejectamenta of the rivers Blackwater and Lagan, in the same neighbourhood. In the demesne of Portavo, near Donaghadee, and in the vicinity of Portaferry, localities in the county of Down, it has likewise occurred to me. The animal is dark gray; tentacula very pale gray—dead shells are white. It was the *P. lævis* which was marked with doubt as "*P. glaber*? Jeff." in Phil. Mag. 1834, p. 300.

4. *Planorbis imbricatus*, Mull. Gray, Man. p. 261. pl. 8. f. 94; Turt. Man. p. 111. f. 94; Drap. p. 44. pl. 1. f. 49—51.
P. cristatus, *Drap.* p. 44. pl. 2. f. 1—3.
Helix nautileus, *Mont.* p. 464. t. 25. f. 5.

This handsome and well-marked species is known to me as occurring throughout Ireland, with the exception of the extreme south, where however there is little doubt that it exists. It is very variable in form—the varieties 1 and 2, and the "monstrosity with the volutions detached, and raised above each other" (Turt. Man.), I have procured on the same plant. The entire animal, together with the tentacula, are of a pale gray colour.

5. *Planorbis carinatus*, Mull. Gray, Man. p. 262. pl. 8. f. 89; Turt. Man. f. 89; Drap. p. 46. pl. 2. f. 13, 14, 16.

Is much less common than *P. marginatus*, but found in all portions of the island—in the earliest catalogues it was inserted as indigenous. In the neighbourhood of Portaferry, county Down, and about the city of Dublin (a recorded locality), it has occurred to me. I have seen specimens which were obtained near Portarlington by the Rev. B. J. Clarke; at a lake near Tyrrell's Pass, Westmeath, by Mr. Ovens; and at Lough Gounagh (county Longford) by Mr. R. Callwell, of Dublin†.

In 1833 Mr. W. H. Harvey favoured me with specimens labelled "*P. planatus*, Turt. Man.," from Portumna on Lough Derg, an expansion of the Shannon, where he stated that the form was frequent, noting it at the same time to have been found by him at Ballitore (county Kildare), where it is very rare—these shells correspond exactly with Turton's description of *P. planatus*, Man. p. 110. This seems to be the common form (though the normal one does likewise occur) at Lough Derg, as testified by specimens since obtained from Portumna and Killaloe‡, near its northern and southern extremities —some from Nenagh (county Tipperary) have been kindly submitted to my inspection by the Rev. T. Hincks of Cork; near this city the "*P. planatus*" is noticed by Mr. Humphreys as met with. Mr. Alder and Mr. Forbes consider the Lough Derg shell *P. carinatus*, and, according to the former, it is the *P. disciformis*, Jeff.

† Mr. Edw. Waller has favoured me with marl shells of this species from Finnoe, and remarks that it is the only shell found there in marl that is not to be had in a living state; but this he attributes to the draining of a marsh.

‡ To the kind attention of Mr. John J. Marshall of the former, and the Rev. C. Mayne of the latter place, I am indebted for them.

6. *Planorbis umbilicatus*, Mull. Jeffreys, Linn. Trans. v. 16. p. 384.
P. marginatus, *Drap.* p. 45. pl. 2. f. 11, 12, 15; *Gray, Man.* p. 265. pl. 8. f. 87, 88, 90; *Turt. Man.* f. 87.

This species prevails in every quarter of the island, but is not generally distributed. Attached to stones at Ram's Island, Lough Neagh, I find a small variety†, about half the ordinary size, and which is concave beneath, with the keel obscure—Mr. Alder remarked on some of these which I had the pleasure of adding to his collection in 1835—"Turton's *P. rhombæus*, of which he sent me specimens, is the same thing in a younger state." Mr. Jeffreys, in a letter dated Oct. 2, 1838, when acknowledging the receipt of the Lough Neagh shell, observed that he considered it distinct from *P. marginatus*, and that from a similar shell previously found at Cardiff, he had named the form *P. inæqualis*. It is to a distorted individual of the *P. marginatus*, found in a pond at the College Botanic Garden, Dublin, that Capt. Brown applied the name of *Helix cochlea* (Irish Test. p. 528. pl. 24. f. 10.), and Turton that of *Helix terebra* (Conch. Dict. p. 62. f. 55.)—Mr. O'Kelly, to whom the shell belongs, always considered it *P. marginatus*, and as such noticed it in the Dublin edition of Pennant's Brit. Zool., p. 363. The Rev. T. Hincks writes me from Cork that "the var. of *Plan. marginatus* with the volutions elevated into a spiral cone was once taken in Ballypheane bog." I have myself met with monstrous forms of several of the native species of *Planorbis*.

7. *Planorbis vortex*, Mull. Gray, Man. p. 267. pl. 8. f. 91: Turt. Man. p. 109. f. 91; Drap. p. 44. pl. 2. f. 4, 5.
Helix vortex, *Mont.* p. 454. t. 25. f. 3.

8. *Planorbis spirorbis*, Mull. Gray, Man. p. 268. pl. 8. f. 98; Turt. Man. p. 115. f. 98.
P. vortex, *β. Drap.* p. 45. pl. 2. f. 6, 7.
Helix spirorbis, *Mont.* p. 455. t. 25. f. 2.

The species which my correspondents (chiefly judging from the descriptions and figures in Turton's Manual) have considered as the *P. vortex* and *P. spirorbis*, are noted as generally common in Ireland—these shells merge so into each other that I was in the habit of putting all that were collected throughout the north together. On comparing these with examples of "*P. spirorbis*" from the neighbourhood of Newcastle, and of "*P. vortex*" from that of London, presented me by Mr. Alder, I find that although some of them are as large as the *P. vortex*, have seven volutions, and a carinated edge to the lower one, that they are not of the extreme form designated by this name, and consequently come under *P. spirorbis*; so likewise do a number of specimens from the neighbourhood of Portarlington sent me by the Rev. B. J. Clarke—those from the river Shannon, favoured me by the Rev. C. Mayne of Killaloe, may

† The size is, I conceive, attributable to the coldness of the water and scarcity of subaquatic plants.

be placed under *P. vortex*, as may those also collected at Lough Gounagh, county Longford, by my friend R. Callwell, Esq. of Dublin. Is the more prominent keel, with other differences necessarily attendant on it, as form of mouth, &c., sufficient for specific distinction between *P. vortex* and *P. spirorbis*? Under *Planorbis discriformis* Mr. Alder has well remarked, that "the degree of carination is so very variable in different individuals of the same species, that it is rather fallacious as a distinguishing character." Mag. Zool. and Bot. vol. ii. p. 113.

Specimens of *P. compressus*, Michaud, from Lorraine, with which I have been favoured by their describer, are identical with those of *P. vortex* before noticed as from Mr. Alder. Examples of *P. leucostoma*, Michaud, with which I have been presented by this most liberal author, differ only from Mr. Alder's *P. spirorbis* in having a white rim within the mouth—on this subject see Supplement to Mr. Alder's Paper in the Newcastle Transactions, and Mr. Gray's edition of Turton's Manual, p. 267; in this work *P. leucostoma*, Mich., is referred to *P. vortex*, but if this is to be considered distinct from *P. spirorbis*, to the latter *P. leucostoma* must be referred.

9. *Planorbis nitidus*, Mull. Gray, Man. p. 268. pl. 8. f. 93.

P. fontanus, *Turt. Man.* p. 110. f. 93.

P. complanatus, *Drap.* p. 47. pl. 2. f. 20—22.

Helix fontana, *Mont.* p. 462. t. 6. f. 6.

Although somewhat rare, this species is distributed over Ireland. On some living specimens taken near Belfast in Dec. 1834, by Mrs. Hincks, and kindly sent to me, the following note was made—"tentacula moderate, or rather short and uniform in colour with the body of the animal, which changes with age, the adult (with shell 2½ lines in diameter) being black; younger individuals pale gray—the shells of the latter are much the more transparent." These animals seemed indifferent which side of the shell was uppermost, and when undisturbed often moved along with what is termed the under side next the surface of the water.

10. *Planorbis contortus*, Mull. Gray, Man. p. 270. pl. 8. f. 96; Turt. Man. p. 113. f. 96; Drap. p. 42. pl. 1. f. 39—41.

Helix contorta, *Mont.* p. 457. t. 25. f. 6.

Like the *P. albus*, generally distributed over Ireland, but of more frequent occurrence, and in greater quantity where found than that species.

Sect. II. Operculata.

Fam. Cyclostomidæ.

Gen. Cyclostoma, Lam.

1. *C. elegans*, Lam. Gray, Man. p. 275. pl. 7. f. 75; Turt. Man. p. 93. f. 75; Drap. p. 32. pl. 1. f. 5—8.

Turbo elegans, *Mont.* p. 342. t. 22. f. 7.

Dr. J. L. Drummond informs me, that when at Sandymount near

Dublin, in 1816, in company with Mr. Tardy, a well-known entomologist, he found one of these shells. In Mr. R. Ball's collection are specimens which were obtained in Glasnevin Botanic Garden, Dublin, but here they might have been introduced with plants from England; in the cabinet of Mr. O'Kelly of that city are two specimens found by himself at Portmarnock; by Mr. S. Wright of Cork, I was shown a similar number, said to have been procured at Youghal †. Notwithstanding this, I am not altogether satisfied that the *C. elegans* is an indigenous species—it has on different occasions been introduced to the country in the present century ‡, but whether to any of the places mentioned previous to the specimens being found there I am uninformed—the fact of only one or two individuals occurring anywhere looks suspicious.

Dr. Turton states that he found a single shell of the *Cyclostoma productum* near the sea-coast in the west of Ireland. Manual, p. 94.

[To be continued.]

XVII.—*On early Contributions to the Flora of Ireland; with Remarks on Mr. Mackay's Flora Hibernica.* By the Rev. T. D. Hincks, LL.D., M.R.I.A.

To the Editors of the Annals and Magazine of Natural History.

[Continued from p. 12.]

Gentlemen,

Mr. Mackay has adopted the natural arrangement in preference to the Linnæan, and in doing this has probably also adopted that system preferred by the Dublin professor. This may have its use, but it seems a strange thing that no two botanists seem to be satisfied with the same arrangement, which is an inconvenience to those who wish to compare the Floras of different countries. It fortunately happens, however, that the variations in the plants contained, occur chiefly in those orders which contain few genera, for it is with respect to genera that the difference is most troublesome. I shall now proceed to offer some remarks upon the work.

p. 5. Ranunculaceæ.—*Thalictrum Alpinum* seems confined to Connaught. Dr. Wade found it in 1801 at Lettery

† Capt. Brown inadvertently notices this *Cyclostoma* as from "Portrush, in the cabinet of Dr. M'Donnell, Belfast." Irish Test. p. 522. The specimens thus alluded to have been shown me by Dr. M'Donnell, and are English—the species is unknown to him as Irish.

‡ Many years ago the *C. elegans*, brought alive from France, was turned out in the neighbourhood of Belfast. Here also, in 1835, a few individuals were introduced, as well as at Killiney-hill near Dublin, and in a garden within that city; and more lately at Summer-hill near Limerick—I am not aware of their having increased in any of these places.

Mountain, Ballinahinch, county Galway. This gentleman was supposed not to have always given due acknowledgement to his fellow-labourers, and was therefore regarded with some jealousy; but this is no reason for suppressing his name, when he was early in his notice of a plant.

Thalictrum minus is found in all the four provinces of Ireland; it was found at Newcastle, county Down, by Mr. Templeton, in 1793. Smith mentions *T. majus* as found by him near Mallow, county Cork.

p. 6. *Anemone Apennina.* Mr. Mackay gives Underwood's authority for its having been found above thirty years ago growing in shady spots near the ground now occupied by the Glasnevin garden. Now Mr. Underwood furnished a catalogue of plants, which was published in the Dublin Society Transactions in 1803-4, in which he inserted this plant as found wild in Ireland. Mr. Templeton sent him queries respecting this and other plants in that catalogue, and I lately read Mr. Underwood's reply, in which he says that *he had never seen it* wild, but had inserted it on Dr. Wade's authority. Dr. W. has it in his Plantæ Rariores, but adds that he cannot take upon him to say that it is truly indigenous. It grows freely in gardens near Glasnevin.

p. 8. *Ranunculus arvensis.* Mr. M. inserts this plant as found in corn-fields near the Man-of-War, county Dublin. Mr. Templeton found it at Agnew's hill, and in Mr. Barklie's shrubbery at Inver near Larne, but thought it probable that it might have been from seed mixed with corn. It is the *R. arvorum, arvensis, echinatus* of Threlkeld, who gives between Raheny and Kilsaughan, county Dublin, as a habitat, flowering amongst corn. It is also mentioned in Underwood's catalogue as a native of Ireland. I am not sure whether these notices are to be considered as additional authority for its being native, or as confirming Mr. Templeton's suspicion.

p. 9. *Caltha palustris var. β. radicans.* Mr. Templeton brought this variety into his garden, where it soon lost its peculiarities in a different situation. This confirms the propriety of not making it a species.

p. 10. *Helleborus viridis.* The specimen referred to in the herbarium of the Cork Institution, which was collected and presented by the late Mrs. Hincks, is there marked as *from the Botanic Garden,* and I never heard of its being found wild by Mr. Drummond. Smith, however, states it as found wild at Tallagh, county Waterford, and Doneraile, county Cork. Dr. Wade says he found it near Dundrum; but Mr. Underwood says that he never saw it wild, so that it is not unlikely it was an escape from a garden and soon eradicated,

as the place has been visited by many botanists. *Helleborus fœtidus* (*Helleboraster maximus*, &c. of old writers) is mentioned by both Threlkeld and K'Eogh, the latter of whom gives the Sliebh Baughta mountains, between the counties of Clare and Galway, and Drumcallagher, county Limerick, as habitats. It is marked as a doubtful native in Great Britain.

Mr. Mackay has 8 genera and 24 species of this order. Of these the old botanists had 6 genera and 14 species; Mr. Templeton, 6 genera and 18 species. Those in which Mr. Templeton was deficient, were *Clematis vitalba* and *Helleborus viridis*, both questionable; *Thalictrum alpinum*, *Ranunculus hirsutus* and *parviflorus*, and *arvensis*, which last he regarded as doubtful. At the end I will give a comparative table of the genera and species in each natural order.

p. 17. *Matthiola sinuata*. Mr. Mackay gives one of the isles of Arran as a habitat. Would it not have been well to have added, that Smith says he found it at Beal Castle, near the mouth of the Shannon, in nearly the same longitude, not much to the south, and near the sea?

p. 22. Threlkeld inserts *Nasturtium petræum foliis bursæ pastoris*, which is *Teesdalia nudicaulis*, Hooker, and not a rare plant in England. It would be well to have some notice of plants said to have been found, but wanting confirmation.

p. 30. *Subularia aquatica*, "said to have been found in Lough Neagh by Sherard." This is language which seems to imply a doubt of that eminent botanist having found it there. Now we know that Sherard was in that neighbourhood probably in 1696. Ray mentions it on his authority; so do Threlkeld and Molyneux, the former of whom gives it the name of *juncifolia*. Mr. Templeton found it in Lough Neagh before 1794, as I find from letters to Dr. Martyn, Editor of the Gardener's Dictionary, and to Mr. Dickson, of Covent Garden; so that there can be no reasonable doubt of the fact. I think I have heard that it has been seen in Sherard's specimens, preserved at Oxford, but I do not recollect my authority.

p. 31. *Viola hirta*. My name is mentioned as authority for this plant being found at Blarney. I have it in a marked catalogue as found by Mr. *Drummond*. I am obliged by the notice of me, as kindly meant, but I wish it clearly understood that I do not consider myself as a competent judge. In the present instance there is no reason to doubt the plant having been found.

p. 38. *Hypericum calycinum*, though I think Mr. Mackay right respecting this plant; yet perhaps it should have been

mentioned that Smith states it as found wild at Ballymaloe, county Cork.

p. 39. *Hypericum elegantissimum non ramosum* of Threlkeld, is given by Sir J. E. Smith as a synonym of *Hypericum montanum*. I find J. White, a gardener of the D. S., quoted as having found this last on mountains in the county Louth. Underwood, in his catalogue, 1804, says it is found in Ireland.

p. 49. I consulted the Herbarium of the Cork Institution in 1839, and found there the *Cerastium aquaticum* as gathered by Mr. Drummond on the banks of the Lee.

p. 76. *Astragalus hypoglottis*. The largest of the south isles of Arran is quoted for this plant as found by Messrs. Ball and Thompson in 1834, as it should be, instead of 1804. Smith says that he found it in the mountains about Killarney, county Kerry.

p. 79. *Trifolium procumbens*, β. Hooker, *campestre*, found by Mr. Templeton at Blackhead and Dunluce Castle, county Antrim.

p. 85. *Hedysarum Onobrychis*, or *Onobrychis sativa*, Hooker. This plant is stated to have been found by J. White, and was admitted as Irish in Underwood's catalogue. Mr. [illegible] has recorded that he saw [illegible] under the Mourne Mountains, on a calcareous soil. I am sure, however, that it was in Mr. Templeton's list of *introduced* plants, which included many that have been inserted.

p. 86. *Spiræa filipendula* is in Molyneux's list, sent to Threlkeld. Was it on this authority that Underwood inserted it as Irish? I observe Mr. Mackay has not inserted it.

p. 110. *Epilobium roseum*. I was surprised to find this wanting in the list. The entry in Mr. Templeton's handwriting is, "*E. roseum*, E. Bot. 693, found and determined in the Orchard, Aug. 13, 1820." When we consider how particular Mr. Templeton was about admitting doubtful plants, and that he was a remarkably close and accurate observer, this plant has more claim to admission than many which have been inserted on a single authority.

p. 116. *Peucedanum Ostruthium*, a habitat in the county Down, is given on Mr. Campbell's authority, but no more said. Threlkeld has *Peucedanum, Hogs' Fennel*, ditches near the sea, which is a likely habitat. K'Eogh mentions it, and Smith, both in his 'Waterford' and 'Kerry,' stating S.E. of Passage in the former county as a habitat. Dr. Barker wrote to Mr. T. that he had found a *Peucedanum* in the county Waterford, but the species is not mentioned.

p. 118. *Meum Athamanta.* Mr. T. has the following entry: "*Athamanta Meum*, E. B. 2249, found plentifully among the grass in the lawn at Maryville, Malone; but as I have not found it elsewhere, it is probably lately introduced, 1818." Such caution gives more weight to Mr. T.'s authority when he does admit a plant.

p. 135. *Hedera Helix.* Mr. T. observed that "Ivy growing against rocks produces gum." I have not seen this noted.

p. 144. Smith, in his 'Kerry,' mentions *Cineraria palustris* and *integrifolia*, the latter on Knockanore mountains. Have botanists looked for these plants? The same author mentions *Diotis maritima* as found on Ballyheigh Strand. Dr. Barker, in 1800, mentioned *Cineraria palustris* as very common in the county Waterford; and in one of his letters to Prof. Martyn or Mr. Dickson, Mr. Templeton mentions a plant resembling a Cineraria, respecting which I do not know that he satisfied himself.

p. 148. *Senecio.* Mr. T. has "*lividus*, E. B. 2515, found about lakes and bogs in the neighbourhood of Ballinahinch, Aug. 14, 1810." As he was evidently familiar with *Sylvaticus*, he could not have confounded them, if, as Sir W. Hooker thinks, the plant in E. B. was not distinct from it.

p. 164. *Hieracium umbellatum.* Mr. Templeton found a Hieracium [illegible] could not assign to any species he knew. This was in 1793, and he sent specimens to Prof. Martyn, and it was referred to in different letters of that period. The Professor, after some time, answered, "that after examining it with Dr. Smith (Sir J. E.) and Mr. Dickson (Covent Garden), they all thought it *umbellatum*." Mr. Templeton cultivated it in his garden, and was at one time inclined to think it might be a variety of *H. subaudum*, but seems to have been at last satisfied that it was *umbellatum*. J. White, employed by the Dublin Society, said that he found this plant in the Mourne mountains about 1803, ten years later. Mr. Mackay speaks of it as found in the county Wicklow; and by Mr. D. Moore in the county Derry. Both these must have been at a much later period.

p. 216. *Betonica officinalis.* This plant is stated in Smith's 'Waterford' to have been found near Cappoquin, and Mr. Templeton marked it as found in the county Waterford, 1801, on Dr. Barker's authority. Mr. Mackay has southern habitats near Killarney, noticed, I presume, by himself, and he adds, "Shane's Castle woods, Mr. Templeton." In Mr. T.'s own Flora he does not say that he had seen it wild, but quotes 'Plantæ Rariores' for Shane's Castle. There must have

been an error in transcribing the list sent to Mr. Mackay, for Mr. Templeton was not a man who would give his authority for what he did not know, nor would any of his family contribute intentionally to an error, however trifling. The northern habitat therefore rests on the authority of Wade's 'Plantæ Rariores.'

p. 219. Mr. Tighe, in the statistical account of Kilkenny, mentions *Thymus Acinos, wild basil*, as found there. It had been previously mentioned by K'Eogh and Threlkeld. There can scarcely be a doubt that it was an introduced plant; but Sir W. J. Hooker has it as found in cultivated fields, though rare in Scotland; and why not admit it on such combined authority into the Irish Flora? It is now called *Acinos vulgaris*. The *hedge hyssop* (*Gratiola*) was said by K'Eogh to be wild on the Burren mountains, county Clare; but the notice is confined to him. Has this district been thoroughly examined by any competent botanist? It is, I think, limestone, and chiefly retained as sheep-walk, so as to have been less cultivated than other parts; it might therefore be expected to have some rare plants, especially as Connemara, the Arran Isles, Kerry, &c., lying near the Atlantic, have been so productive of them. *Gratiola officinalis* is found in moist places in several parts of Europe, as far north as Denmark; and *G. linifolia*, a native of Portugal, differs little from *G. officinalis*, except in being smaller, and its leaves linear and entire. Portugal is nearly in the same longitude, and has the same exposure to the Atlantic as the west of Ireland.

p. 231. Scleranthe.æ or Paronychie.æ.—Dr. Smith, in his 'Kerry,' mentions *Herniaria glabra* as found at Lamb's Head, mouth of Kenmare river. Mr. Mackay has borne testimony to the correctness of this author in instances which came under his notice; it is probable, therefore, that he was correct in this, as neither the *place* nor the *character* of the plant would lead us to think it introduced or confounded with another. Two species of *Herniaria* have been established by Mr. Babington, and admitted by Sir W. J. Hooker: *H. glabra*, found in Jersey and Guernsey; *H. ciliata* (separated from the other), found near the Lizard Point, Cornwall. This species might be the one found near the mouth of Kenmare river.

p. 240. *Ceratophyllum demersum*. The northern habitats for this plant in Mr. M.'s Flora are "Near Killaleagh, Isle of Rathlin and Lough Neagh—Mr. Templeton." There has been some mistake, originating perhaps in the substitution of N for L. It should be, "Isle of Rathlin, and Lough Leagh, near Killaleagh." Mr. Templeton, on whose authority the habitats are given, found it at Rathlin, 1795, and at L. Leagh, 1804.

p. 243. By some mistake, originating perhaps in the list sent to Mr. Mackay, the habitats for *purpurea* and *rubra* are the same, so far as Mr. Templeton is concerned. These habitats are more correctly given under *purpurea*, but they really belong to *rubra*, as it was ascertained to be the *rubra* of Hudson, from his herbarium in Mr. Lambert's possession. Mr. T. does not appear to have met with *purpurea*, though he might have called his plant so, till he had the opportunity of comparing it.

p. 245. *S. amygdalina*, stated to be found "by the side of the Bann, at Fairhead, among rocks," Mr. Templeton. The notice belonged to *pentandra*, and has been transferred (by a mistake, pardonable enough amidst various communications) to *amygdalina*, which Mr. T. appears not to have found, though he had it in his garden. The above appears as one habitat, but is really two; "by the side of the Bann, and at Fairhead, among rocks," the places being at a considerable distance. Mr. T. found it in three places—1st, in 1793, near Ballycastle, but then considered it as introduced; 2nd, apparently wild, near the Bann; and, at a still later time, among the rocks at Fairhead.

p. 248. Mr. Templeton early proposed the union of several of the species combined by Sir W. Hooker under *fusca*. In 1793 he wrote to Professor Martyn, that a willow he called *rosmarinifolia*, *fusca* and *repens*, were only varieties; but in 1794, having got a plant of *S. rosmarinifolia* from London, he told Mr. Dickson that he saw that he had been mistaken respecting it. He included *S. prostrata* and *ascendens* as other varieties, which he mentioned to Dr. Taylor in a letter in 1814, so that he anticipated the union of these species made by Sir W. J. Hooker, and adopted by Mr. Mackay.

p. 285. Asphodeleæ.—Dr. Smith, in his 'Waterford,' states that *Asparagus sylvestris* is wild on the sea-coast at Tramore. Threlkeld and K'Eogh had both previously stated it to be wild on the sea-coasts, and I think it is in Mr. Tighe's catalogue of maritime plants, but I have not the list to refer to. It is found on the opposite coasts of England and Wales, and it is reasonable to think that the gentlemen mentioned either found it or some plant mistaken for it. The *Juniperus Sabina*, which is mentioned by Threlkeld, Smith, and others, Mr. Templeton conceived to have originated in *Lycopodium alpinum*, which is found on the mountains, referred to as habitats of savin. They might have been indifferent botanists, but we have no ground for suspecting them of wilful falsehood.

Remarks of the preceding kind might perhaps be increased, but these are what occurred to me, and they may be thought by some of little use. In communicating them, I comply with

the wish of others, and I trust have said nothing which can be offensive to any; but I shall be particularly happy if I can contribute in the least degree to the due estimation of a departed friend, who is, and ought to be, the pride of the North of Ireland, the late JOHN TEMPLETON, to whom Belfast, in particular, owes much of that high character which she has attained amongst the cultivators of Natural History in all its branches.

Comparative Summary of the Plants noticed by Botanists before 1760; of those noticed by Mr. Templeton and his coadjutors before 1804; and of those noticed by Mr. Mackay in his 'Flora Hibernica,' according to the Natural Orders adopted by him.

	O. B.		T.		M.	
ORDERS.	G.	Sp.	G.	Sp.	G.	Sp.
1. Ranunculaceæ ..	6	14	6	18	8	24
2. Berberideæ	0	0	0	0	1	1
3. Nymphæaceæ .	2	2	2	2	2	2
4. Papaveraceæ. ..	3	5	4	7	4	8
5. Fumariaceæ	2	2	2	3	2	4
6. Cruciferæ	20	37	20	33	23	49
7. Violaceæ	1	4	1	6	1	8
8. Cistineæ	1	1	0	0	1	1
9. Droseraceæ	1	3	1	3	1	3
10. Polygaleæ.....	1	1	1	1	1	1
11. Malvaceæ.....	2	4	2	4	3	5
12. Hypericineæ....	1	7	1	8	1	9
13. Caryophylleæ ..	10	15	10	28	11	37
14. Lineæ	2	4	2	4	2	5
15. Tiliaceæ	1	1	1	1	1	2
16. Acerineæ	1	2	1	1	1	2
17. Geraniaceæ	2	7	2	11	2	13
18. Oxalideæ	1	1	1	1	1	1
19. Portulaceæ	0	0	1	1	1	1
20. Crassulaceæ	3	6	4	8	4	10
21. Saxifrageæ	3	6	4	10	4	18
22. Salicariæ	2	2	2	2	2	4
23. Rhamneæ.....	1	1	1	2	1	2
24. Ilicineæ.....	1	1	1	1	1	1
25. Celestrineæ	1	1	1	1	1	1
26. Leguminosæ....	12	22	13	31	15	41
27. Rosaceæ	11	23	13	33	13	50
28. Pomaceæ	2	4	2	4	2	5
29. Grossulaceæ....	0	0	1	3	1	3
30. Onagrariæ	1	4	1	6	1	6
31. Circæaceæ.....	1	1	1	2	1	2
32. Haloragеæ	0	0	2	2	2	3
33. Umbelliferæ	25	31	28	38	29	44
34. Stellatæ	4	8	4	10	4	13

Orders.	O. B. G.	O. B. Sp.	T. G.	T. Sp.	M. G.	M. Sp.
35. Caprifoliaceæ ..	5	6	5	6	5	6
36. Vaccinieæ.....	1	2	1	3	1	3
37. Campanulaceæ.	1	1	1	3	1	4
38. Lobeliaceæ	2	2	2	2	2	2
39. Valerianeæ	2	2	2	4	2	4
40. Dipsaceæ	3	3	3	3	3	3
41. Compositæ	36	56	36	62	40	87
42. Borragineæ	8	11	8	14	8	16
43. Convolvulaceæ ..	2	3	2	4	2	4
44. Plantagineæ	1	4	2	5	2	6
45. Polemoniaceæ ..	1	1	1	1	1	1
46. Plumbagineæ ..	1	2	1	2	1	3
47. Oleineæ	2	2	2	2	2	2
48. Ericeæ	5	6	4	5	5	9
49. Pyrolaceæ.....	1	1	1	3	2	5
50. Apocyneæ.....	1	1	0	0	1	2
51. Gentianeæ ...	4	5	5	7	6	11
52. Solaneæ	5	6	3	3	5	7
53. Primulaceæ	5	10	7	13	7	13
54. Lentibulariæ....	1	1	2	5	2	6
55. Scrophularineæ..	9	21	9	23	10	30
56. Orobancheæ....	2	2	2	3	2	4
57. Melampyraceæ..	1	1	1	2	1	2
58. Verbenaceæ	1	1	1	1	1	1
59. Labiatæ	19	28	17	31	20	43
60. Polygoneæ	2	11	3	17	3	20
61. Chenopodeæ....	5	12	5	17	5	19
62. Schleranthеæ ..	0	0	1	1	1	1
63. Urticeæ.....	3	4	3	4	3	5
64. Resedaceæ	1	1	1	3	1	3
65. Euphorbiaceæ ..	2	6	2	7	2	9
66. Empetreæ.....	1	1	1	1	1	1
67. Callitrichineæ ..	0	0	1	2	1	2
68. Ceratophylleæ ..	0	0	1	2	1	2
69. Ulmaceæ	1	1	1	1	1	4
70. Amentaceæ	7	13	6	24	9	43
71. Myriceæ	1	1	1	1	1	1
72. Coniferæ	3	3	3	3	3	3
73. Aroideæ.....	1	1	1	1	1	1
74. Typhaceæ.....	2	2	2	5	2	5
75. Fluviales	1	4	4	13	4	15
76. Pistiaceæ	1	1	1	3	1	4
77. Juncagineæ	0	0	1	2	1	2
78. Alismaceæ.....	1	2	2	4	2	4
79. Hydrocharideæ..	0	0	2	2	2	2
80. Irideæ	1	2	1	2	2	3
81. Orchideæ	4	8	7	16	8	22
82. Melanthaceæ....	0	0	1	1	1	1
83. Amaryllideæ....	1	1	1	2	2	4

Orders.	O. B. G.	O. B. Sp.	T. G.	T. Sp.	M. G.	M. Sp.
84. Asphodeleæ	3	5	3	4	3	6
85. Smilaceæ	2	2	0	0	2	2
86. Butomeæ	1	1	1	1	1	1
87. Restiaceæ	0	0	0	0	1	1
88. Junceæ	2	5	3	14	3	16
89. Gramineæ	9	10	27	73	30	80
90. Cyperaceæ	3	5	8	56	8	66
91. Filices	13	18	13	25	15	32
92. Lycopodiaceæ ..	1	2	1	4	1	4
93. Marsiliateæ	0	0	1	1	2	2
94. Equisetaceæ	1	4	1	6	1	8
95. Characeæ	1	2	1	5	1	7

In the preceding list Mr. Mackay's Flora is taken as the basis, and no plant is admitted in any order which he has not inserted; of course additions might have been made of plants recorded as found by the older botanists; and while a very few are omitted in Mr. M.'s work, which Mr. T. considered as natives, many were passed over by him which he did not recognise as native, and did not insert in his list. Again, a few were omitted which he had entered on the authority of *Plantæ Rariores*, or other authorities, but had not verified. On the other hand, a few may have been reckoned which he did not find till after 1804; but, on the whole, I believe the first list contains a fair statement of what was known of the botany of Ireland previous to 1780, including the discoveries of Smith and others; the second, a fair statement of what was known to Mr. Templeton and his correspondents previous to 1804, when Mr. Mackay came to Ireland; and the third, the number of plants in each natural order contained in Mr. Mackay's work, without including a few additions that have been since made*. It will appear that the old botanists were peculiarly deficient in water-plants, and in the grass, and grass-like tribes, whilst the late discrimination, and consequent increase of species, must tend to swell the apparent difference. Many plants may still be added, but the fact that the Flora of Ireland was not so neglected as some imagined, will, I trust, be made evident by the statements in the preceding paper and lists.

I have now, gentlemen, with best wishes for the success of your useful publication, to subscribe myself your obedient servant,

Thomas D. Hincks.

Belfast, May 6, 1840. Cor. Sec. Belfast Botanical Society.

* The list of course includes all discovered after 1804, which are contained in Mr. M.'s work, whether discovered by Mr. M. himself, Mr. Templeton, Mr. Drummond of Cork, Mr. Moore, or others to whom Mr. M. has assigned them.

XVIII.—*Report of the Results of Researches in Physiological Botany made in the year* 1839. By F. J. Meyen, M.D., Professor of Botany in the University of Berlin*.

On the Nutrition and Growth of Plants.

M. Lampadius† has instituted some new experiments on the vegetation of wheat in different soils, and on the quantity of earthy matters contained in the wheat plants so cultivated; from which he arrives at the conclusion that the quantity of earthy matter in the plants produced on the different soils (viz. those rich in alumina, silicic acid, lime or magnesia) remains always the same, and that these substances are not taken up mechanically by the roots, but are selected by the *Vegetative Power* by means of the roots, and are then deposited in different combinations in the plants for the formation of their several parts.

The facts from which these conclusions were drawn were the following: A piece of field was divided into 5 beds, each 20 Prussian feet square. Each bed received first of all 5 lbs. of manure (a mixture of cow- and horse-dung), then on the 1st bed were strewn 5 lbs. of finely powdered quartz, on the 2nd the same quantity of alumina, on the 3rd the same of chalk, and on the 4th 5 lbs of carbonate of magnesia; the 5th was left without any mineral manure at all. On each bed were sown 2 Pruss. cubic inches of wheat, about 675 grains. The next summer the vegetation appeared most vigorous on the bed strewn with alumina, and the produce of grains of wheat on the 5 beds, was, according to weight, as follows:—

	Produce.	
Bed	oz.	dr.
1	21	2
2	28	6
3	26	2
4	21	4
5	20	0

After incineration it appeared that the grains which had been produced from the different beds contained almost equal

* Translated from the German, under the direction of the Author, by Henry Croft, Esq.

On commencing the publication of Professor Meyen's Report for 1839, it is with much concern that we have at the same time to record the death of the author, whereby Natural History sustains a heavy loss. Translations of his valuable Reports for the years 1835 and 1837, by Mr. W. Francis, have been published; the former in the Lond. and Edinb. Philosophical Magazine, vol. xi. pp. 381, 435, 524; xii. 53; the latter in a separate volume.—See Annals Nat. Hist. vol. v. p. 211, and Mag. Nat. Hist. vol. iv. p. 408.

† Erdmann's und Marchand's Journal für practische Chemie, Bd. xviii. p. 257—269.

quantities of inorganic matters, and the same result was obtained on incinerating the chaff, the straw, and the roots; and it moreover appeared that the roots and chaff were the richest in inorganic substances. The entire plants contained by weight from 3·7 to 4·08 per cent. The quantitative examination of the ashes showed that the quantities of silicic acid, lime, magnesia and alumina were nearly the same in the plants grown on all the different soils.

The conclusions which M. Lampadius has drawn from these analyses appear certainly quite evident; but at the same time I may be allowed to remark, that the results would have turned out quite differently if he had chosen some more easily soluble salts as manure, instead of chalk, silicic acid, &c., and that the above experiments would have been much more valuable if he had before given the analysis of the soil with the manure used; and therefore I believe that the question as to whether the roots are able to select this or that substance, remains completely unanswered by this in other respects highly interesting research.

M. Boussingault has continued his chemical researches on vegetation*, and has this time chosen as his subject the impoverishment of the soil and the study of the benefits of "alternation (wechselwirthschaft—assolemens†)." In the researches of M. Boussingault alluded to in last year's Report, it was shown that plants receive a part of their nourishment from the air; and in the present memoir M. B. endeavours to show that the most fruitful "alternation" (!) is that by which the greatest quantity of elementary bodies is absorbed from the atmosphere. Now it is highly important to know the exact quantities derived from the air, in order to be able to compare the merits of different methods of cultivation. On an estate, with the products of which M. B. was well acquainted, it was found, that the manure which was used for one hectare of land contained 2793 kilogrammes carbon. The produce from this piece of land contained on the other hand 8383 kilogr. carbon, and from this M. B. concludes, that the carbon derived by the plants from the air was at least 5400 kilogr. The given quantity of manure for one hectare of land contained 157 kilogr. nitrogen, while the produce contained 251, and therefore the atmosphere must have yielded the excess of 94

* "De la discussion de la valeur rélative des assolemens par l'analyse élémentaire."—Ann. des Sciences Naturelles, Part. Botan. 1839, t. xi. pp. 31——38."

† *Wechselwirthschaft.* Different kinds of corn or other plants are cultivated on a piece of ground in a certain succession for three or more years; the land is then allowed to lie fallow for a certain time, and then the same succession or alternation is proceeded with.

kilogr. In another very productive alternation (?) which was however abandoned on account of the climate, the quantities of matters taken from the atmosphere appeared to be much greater. The produce contained 7600 kilogr. carbon, and 160 nitrogen more than the manure employed; by a three years' alternation, the fourth year the ground being manured and lying fallow, the quantity of carbon absorbed from the air was only 4358, and of nitrogen 17 kilogr.

According to M. B.'s researches, of all our common cultivated plants, *Helianthus tuberosus* takes up most from the atmosphere, and therefore this is the plant with which the smallest quantity of manure produces the largest quantity of nutritious matter. The chemical composition of the several products have been placed together in a table: in it we find the ultimate analyses of wheat, rye, barley, wheat-, rye-, and barley-straw, potatoes, beetroot, turnips, *Helianthus tuberosus* and of its stalks, yellow peas, pea-straw, red sorrel, and of manure. M. Boussingault remarks, that most of these nutritive substances have different tastes, but at the same time almost the same ultimate constitution. It cannot be said that these bodies consist of carbon and water, for in almost every instance there was a small excess of hydrogen; and from this it follows that during vegetation water is decomposed, as MM. Edwards and Colin (Report for 1838, p. 7) are said to have proved.

A very advantageous report of the above research was given to the Academy on the 14th of January, 1839, in the name of the Commission, by M. Dumas.

M. Unger, in a treatise, entitled 'Die Antritz quelle bei Gratz in Bezug auf ihre Vegetation*,' the contents of which are principally of a physical nature, has made known a number of observations, from which he arrives at the conclusion, that the free carbonic acid in springs has no influence in promoting vegetation, that it nevertheless causes the appearance of some plants, and must therefore be ranked among those causes which influence the *quality* of the vegetation.

M. Nietner, court-gardener in Schönhausen, near Berlin, has explained his views with regard to the necessity of varying plants, in order to arrive at successful results in their cultivation†. The theory, he states, is on the whole as follows: "The spongioles being the only parts of the subterranean part of the plant which imbibe nourishment, give off certain substances, which for succeeding plants, if they be of the same

* Linnæa of 1839, pp. 339—356.

† Kurzer Umriss der Rotation oder des Wechsels der Pflanzen. Verhandlungen des Vereins zur Beförderung des Gartenbaues in den Preussischen Staaten, xiv. 1839, pp 158—162.

species, are injurious; but if of a different genus, are, if not exactly favourable to their growth, still certainly not hurtful, as in the former case." This theory is to be found, it is true, in the most celebrated botanical works, but in the newer physiological ones it is circumstantially enough proved, that this theory is nothing better than an hypothesis, for the known experiments on which it has been founded have been shown to be incorrect; and therefore I cannot agree with those views according to which the advantageous influence of the changing plants is explained by M. Nietner. The several instances which are adduced as proving the correctness of the above theory, can be explained in a different manner; particularly the luxuriant growth of rye after three years' cultivation of sorrel, in which case the soil requires no manure. I do not suppose it is necessary to assume here an excretion from the sorrel roots which is beneficial to the rye, which moreover has by no means been proved; but one must look for this excellent manure in the roots and stubble of the sorrel plants.

Moreover, M. Nietner remarks, that carrots, parsnips? (weisse Rüben), and other bulbous plants acquire a bitter unpleasant taste, and become scarcely edible when cultivated on a soil which in the previous year has borne tobacco. This may however be explained by the great mass of the tobacco plants which always remains on such a field; these masses, abounding in alkaloids and still imperfectly decomposed extractive matters, pass over more or less into those plants which follow next.

It has at length been acknowledged in France that the results of the experiments of Macaire on the excretions of the apices of the roots of plants, on which so important theories have been founded, cannot be correct. M. H. Braconnot of Nancy has opposed the conclusion drawn by Macaire from his experiments. M. Braconnot* planted a large specimen of *Nerium grandiflorum* in a pot which had no opening at the bottom, and let it grow therein for three years, and when the earth was examined at the expiration of that time, it was found that there was nothing therein beyond the usual salts, and none of that peculiar poisonous sharp principle peculiar to *Nerium*. In the same manner the root-excretions of *Inula Helenium, Scabiosa arvensis, Carduus arvensis*, and of several *Euphorbiaceæ* and *Cichoriaceæ* were examined, but without satisfactory results. Hereupon some of Macaire's own experiments were repeated; but instead of *Chondrilla muralis*

* "Recherches sur l'Influence des Plantes sur le Sol."—Annales de Chemie et de Physique, Septembre, 1839, pp. 27—40.

common lettuce was taken and placed with its roots in water. The result of this experiment agreed with Macaire's, i. e. a portion of the lacteous sap was found in the water, the appearance of which however M. Braconnot correctly refers to the tearing of the fine rootlets. Some plants of *Euphorbia Peplus* which grew in water, imparted to it no taste, and it remained colourless: moreover the soluble substances in moulds in which *Euphorbia Brioni*, *Asclepias incarnata*, and *Papaver somniferum* had been grown, were examined, but the results were not favourable to Macaire's conclusions. Finally, Macaire's experiment with "*Mercurialis annua*" was repeated. One half of the roots of this plant was placed in a weak solution of acetate of lead, and the other half in pure water. In the end, the water contained some of the lead salt which had been given to the roots in the other vessel. This is, however, explained by Braconnot as the simple effect of capillary attraction in the roots, an explanation to which I cannot assent; it is by no means necessary to seek for such a one, for we can explain the phenomenon much more simply without having recourse to Macaire's views, according to which plants have the power of excreting substances injurious to them by means of their roots.

In last year's Report notice was taken of M. Payen's researches on the chemical composition of the woody substances; but they were only published with additions in the beginning of the present year*. M. Dumas gave an excessively favourable report of this research to the Academy†; however, many of the discoveries contained therein had already been published in Germany, &c., as was shown in the former Report.

It is now several years since the newer microscopes have shown that the original stratum or layer of cellular membrane exhibits characters different from those of the secondary layers: indeed the chemical difference of these parts was proved by the observations of Schleiden, and this fact has been confirmed and extended by M. Payen. The first series of ultimate analyses was made with quite tender cellular tissue, which was viewed as the primitive layers of the woody cells; for this purpose were used the ova of almonds, cucumber sap, the tender cellular tissue of cucumbers, pith of elder, pith of *Æschynomene paludosa*, cotton and "root-spongioles," (*Wurzelschwämmchen*): by this is probably meant the small extremities of roots; for I have long since proved that these "spon-

* Annales des Sciences Naturelles, 1839. Part. Botan. i. pp. 21—31.
† *Ibid.* pp. 28—31.

gioles" do not exist. All the analyses show that one may assume the proportion of oxygen to hydrogen to be as in water, and that these substances are isomeric (perhaps polymeric, H. C.) with starch, for the small differences found may be considered as faults in the analyses. With regard to these analyses it may be remarked, that however correct they may be, they by no means show us the correct composition of the primitive membrane; for in the cells of the youngest ova, as well as in those of the cucumber, elder pith, and principally of the root-extremities, indeed, even in the fibres of cotton, there is contained a great quantity of organic substances which cannot be separated without destroying the tender tissue, and the presence of these matters renders the analyses of the membrane unsatisfactory. However, we may assume, that by far the greater portion of these substances have an isomeric constitution with starch. Moreover several kinds of wood were analysed in order to show the difference of composition of the primitive membranes of their cells.

Oak.			x.	Aspen.	
In its natural state.	Treated with carb. of soda		Treated with carb. soda.	Treated once with carb. sod.	Treated twice with carb. sod.
51·11	49·68 .	51·35	.. 49·10	48·00	47·71
6·21	6·02 ..	6·25	.. 6·13	6·10	6·12
39·32	11·30	39·50	44·17	45·56	. 45·87

From these analyses it certainly appears that in the ligneous substance, besides carbon and water, moreover free hydrogen must be present; but here it must also be remarked, that it is almost impossible to separate the membrane of the woody cells from their contents, and the microscope shows that various and perhaps resinous substances are contained in them.

In a note sent into the Academy on the 24th of December, 1838, M. Payen states, that by means of nitric acid he has extracted the incrusting matter of the ligneous cells from the primitive membranes: for this purpose finely rasped oak and box wood were used. The incrusting substance (by which is meant the inner layers of the cellular membrane) dissolved in nitric acid, and was thus separated from the residual tissue, which, after repeated purification, was dried and analysed. The composition was found to be

C	43·85
H	5·86
O	50·28

whilst the above analyses gave quite a different result. According to this then the secondary layers of the cellular membrane must exhibit a striking difference in constitution; but

this is very improbable; for it was shown at length in the former Report, that it is exactly these secondary layers, which by boiling with an alkali, &c., are converted into a starch-like substance; besides, the microscope should have been used before those analyses were made, but such observations are not mentioned.

In the meeting of the Parisian Academy on the 14th of January, M. Payen read a paper, entitled "Mémoire sur les applications théoretiques et pratiques des propriétés du tissu élémentaire des Végétaux*," the contents of which are of considerable interest, but would here lead us too far into the province of Chemistry.

On the 4th of February, 1839, new researches were made public by M. Payen; he gave the composition of the incrusting matter of wood as $C^{12}\ H^{14}\ O^{10}$, while the formula for the primitive cellular membrane is $C^{24}\ H^{20}\ O^{10}$ or $C^{24}\ H^{18}\ O^{9} + H^{2}\ O$. In the sitting of the Academy of the 30th of July, a new treatise by M. Payen was read, "On the tissue of Plants and on the incrusting substance of Wood†," an extract from which has been published by the author. M. Payen remarks, that he had already made known to the Academy his researches, according to which all young parts of plants contain a considerable portion of substances containing nitrogen; that moreover the peculiar substance of the membranes in different plants has always the same composition; and that in those parts which are grown woody by age, there are contained two chemically different substances, viz. the primitive membrane and the hard incrustation.

"Many tissues," observes M. Payen, "acquire a high degree of hardness without possessing large quantities of incrusting matter." (In the same manner we may bring forward cases where many cells with thickened sides have no hardness, and it is evident from this that the hardness of the vegetable substance does not depend solely on the thickening of the walls of the cells, but on the chemical change in the layers of cellular membrane, M.) The latest analyses and microscopical observations of M. Payen have led him to conclude that wood consists of not less than four different substances, viz. the primitive cellular membrane, and the sclérogène, which again is said to consist of three peculiar matters; the one insoluble in water, alcohol, and æther, the other soluble in alcohol, and the third in all three solvents. The ultimate composition of these four substances in the above order is as follows:—

* Comptes Rendus de 14 Janv. 1839, p. 59.
† *Ibid.* 20 Juill. 1839, p. 119.

	I.	II.	III.	IV.
C	44·8	48·	62·8	68·53
H	6·2	6·	5·9	7·01
O	49·0	46·	31·3	24·43

By the action of concentrated sulphuric acid the primitive membrane was converted into dextrin and sugar, and in this manner the sclérogène was separated.

Finally, M. Payen has published a treatise on the different states of aggregation of vegetable tissues*. The substance which forms the cellular membrane is said to be in a pure state, but in a less firm state of aggregation, in starch. He has examined the membranes of several of the lower plants, which are nearly allied to the above-mentioned substance in their chemical and physical properties. The first comes to the consideration of the appearance of starch in lichens, and arrives at the same results as have already been made known in a former Report, viz. that the cellular membranes of lichens are coloured blue by iodine, and that in such plants it is these which dissolve to a jelly. On this occasion M. Payen remarks that he has analysed the spiral vessels of *Musa*, and has found their composition similar to that of other membranes†. Moreover he analysed the purified membranes of the threads of *Rivularia* which support the spores, and found it of the same constitution as starch. In the same way the tissue of mushrooms was analysed, after careful purification, and found to be a substance isomeric with the membranes of other plants; the same was found with the membrane of *Chara*. Finally, M. Payen directs attention to the fact, that the vegetable cellular membrane is only a ternary compound, while the quaternary organic compounds are found among the animal tissues; and although many parts of plants abound in nitrogen, still this body is only found in the *contents* of the cells.

M. Payen has also made known his views concerning the Nutrition of plants‡. The cambium appears at first as a granular contractile substance, containing nitrogen. This sub-

* "Mémoire sur les états différens d'aggrégation du tissu des Végétaux."—Comptes Rendus de 26 Août, 1839, p. 296.

† "An ultimate analysis of the spiral fibres of *Musa paradisiaca* was made in the year 1838, by Prof. Mitscherlich and myself, (vide Meyen's Pflanzen Physiologie, ii. p. 551, and English translation of Meyen's Report for 1837, p. 26) which, however, gave quite a different result: microscopical observations show that these spiral fibres may be compared with the secondary cellular membranes, and therefore they must have a similar composition to that of Payen's sclérogène, if indeed his apparently so correct analyses may be fully trusted."—Meyen.

‡ "Mémoire sur la nutrition des Plantes."—Comptes Rendus, de 21 Oct. p. 509.

stance is gradually developed and becomes enclosed in cells whose sides consist solely of carbon and the elements of water.

Afterwards a substance is formed rich in carbon and containing three times more hydrogen than if it consisted of carbon and water. From this it appears to him that the necessity of an excess of hydrogen in vegetation may be proved. The substance containing so much hydrogen is said to be a thick fluid, &c.

[To be continued.]

XIX.—*Account of a Specimen of the Oblong Sunfish*, Orthagoriscus Oblongus, *taken at Par in Cornwall, and preserved in the Museum of the Royal Institution of Cornwall at Truro.* By Jonathan Couch, F.L.S., M.R.C.S. of Corn-

Notwithstanding that the figures and description of the Oblong or Longer Sunfish, as published by Borlase, Montagu, Donovan and Mr. Yarrell, would seem sufficient to remove all doubt of the specific character of this fish, and the great difference between it and the more common species, *O. Mola*; yet even now this conclusion does not seem universally assented to. It is with great pleasure, therefore, that I am able, from examination of a specimen, to add my testimony to that of the above-named distinguished naturalists. The specimen had wandered into the lock of the new-made canal at a short distance west of Fowey; and being deemed extraordinary, though without a full knowledge of the interest attached to it, it was carefully skinned and preserved, to be presented to the Royal Cornwall Museum. The length is 22 inches; depth, measured on the round, from back to belly, $11\frac{1}{2}$; from snout to the eye, $2\frac{3}{4}$; to the origin of the pectoral fin, $8\frac{1}{2}$; length of this fin, $4\frac{1}{4}$; caudal fin $1\frac{1}{2}$ inch wide, or more properly, long; anal fin 6 inches—as I suppose is the dorsal, but the latter is a little injured. The number of fin rays is here given:

P. 15, D. 18, A. 17, C. 18.

The figure of this fish, which is here forwarded, is so little different from that given by Mr. Yarrell ('British Fishes,' vol. ii. p. 354.), as scarcely to require remark; I would therefore only point out, that in this skin there appears a plait bound over the upper lip, and that the rays of the dorsal and anal fins are bent into a curve at their termination; neither of which circumstances are marked in Mr. Yarrell's figure; probably be-

cause they were not conspicuous in the recent specimen originally examined by Donovan.

Mr. Yarrell's figure of the Shorter Sunfish is taken from a young specimen, and therefore but inadequately represents that species in its mature growth. The many opportunities, however, which I have had of examining this fish, and sometimes of large size, will allow of no doubt of its being distinctly separate from its far more rare congener, the Oblong Sunfish. The fin rays will probably be found to differ in the different specimens of both these species; but together with the lengthened form of the body, and shape of the mouth, the different shape of the pectoral fin will be sufficient to prevent all further hesitation on the subject.

Polperro, September 1, 1840.

BIBLIOGRAPHICAL NOTICES.

Icones Fungorum, &c. Tomus 3. J. C. Corda. Pragæ, 1839.

We have already twice noticed this valuable work, which is contributing greatly to our knowledge of Fungi. Our especial object, however, in again adverting to it, is to direct attention to the confirmation it affords of Léveillé's new views of the structure and nature of Entophytous Fungi, of which an account is given in the 11th volume of the New Series of Annales des Sciences Naturelles. M. Corda's observations are perfectly independent of those of the French mycologist; and both the learned authors, whose discoveries were published in the same year, appear entitled almost equally to the credit attached to them, though M. Léveillé has followed out the subject more completely. Indeed, Corda's observations are confined to a single species. The facts made known are very important, and are scarcely second in interest to those which have been accumulated lately regarding the *Hymenomycetes*.

It is well known that various opinions have prevailed as to the nature of *Entophyta*, and that M. Unger has lately paid much attention to the subject, and has arrived at the conclusion satisfactory to himself, but not equally so to all mycologists, that they are mere exanthemata analogous to cutaneous eruptions in mammalia. M. Léveillé, however, not contented with this notion, has examined them still more recently, and has discovered that in those species in which the cuticle of the matrix is most easily removed, there is immediately beneath it a true mycelium, from which the fungus is ultimately developed: and Corda, who has given most beautiful figures, though he appears not to have paid particular attention to the more early stages of growth, has shown that this mycelium penetrates the cells and interstices which are beneath the sori. This we have ourselves observed in *Æcidium Euphorbiæ*, the only species we have at present examined. Léveillé has also shown that this structure prevails

in the group, though some points of especial difficulty will probably still occupy his attention. Corda's observations as to the origination of the spores from sporophores and their moniliform arrangement, though something of the kind was figured by Unger, deserve further attention. The fact, then, that the *Entophyta* are true Fungi is completely set at rest, though at present we do not think that their affinities are clear.

Next in point of interest are the observations on *Stilbospora*, *Melanconium*, &c., in which the spores are shown to spring from sporophores. This is easily seen in *Stilbospora pyriformis*, a generally distributed species. A similar structure prevails in the analogous genus *Diplodia*. When these observations are more extended we trust that some light will be thrown on many Fungi now arranged in *Sphæria*, but differing materially in structure. *Acrospermum*, again, appears to be very near to *Sphæronema*, an affinity which could scarcely be suspected from the place long assigned to the genus in the neighbourhood of *Sclerotium*. The last three plates are devoted to the structure of *Hymenomycetes*; and though there is little novelty, they are not without interest. We would again express an anxious hope that the work may meet with due encouragement.

Plantes Cryptogames de France. Fasc. 21. Par J. B. H. J. Desmazières.

This beautiful work, too, we have already noticed, but the present Number is so peculiar, as exhibiting nearly a monograph of *Ceramiaceæ*, of which it contains fifty species, and is so admirably got up, that we should deem it unpardonable not to call the attention of our readers to it. The specimens have been collected in great part by Messrs. Crouan, who have so diligently investigated the *Hydrophytes* of Brest, and they have been conjoined with M. Desmazières in the digestion of the materials.

No pains have been spared in ascertaining the synonyms and reconciling the species of Agardh and Duby, who have considered the subject as if the memoir of Bonnemaison on the articulated *Hydrophytes* had not existed. The learned authors are most anxious to have the most perfect materials possible, with a view still more accurately to reconcile all differences, and would, we know, feel highly obliged to any British Algologist who would send them specimens of British *Ceramiaceæ*, especially of such species as are described in the English Flora, but have not hitherto been figured.

Monographia Tuberacearum, Auctore Carolo Vittadini. Mediolani, 1831.

To those who are acquainted only with the species of *Tuber* and its allied genera, as described by Fries in the 'Systema Mycologicum,' the present work will afford no little surprise and pleasure. It is, indeed, quite extraordinary to see the number of well-defined species and genera which are here characterized; some of which present a

structure as curious as unexpected. A few will require to be removed to the *Hymenomycetous* group, where one of these subterranean genera, closely connected with *Clavaria* through *Sparassis*, exhibits most beautifully the change which takes place in consequence of a change of habit. Others, again, will fill up blanks among the *Lycoperdonaceæ*, and possibly amongst the *Phalloideæ* also. The affinity of these two groups has been shown in this Journal, and the circumstance of the ultimate condition of the fructifying mass when mature being so different in the two groups, was considered as comparatively of slight importance. This is completely confirmed by the genus *Elaphomyces*, which, though its contents are at length quite dry and dusty, and intermixed with flocci, as in true *Lycoperdons*, is nevertheless a certain ally of *Tuber*. An opportunity of examining both our British species together in the spring, before we had seen the work of Vittadini, had convinced us of this fact, and our views are fully confirmed by the Italian mycologist. The spores are, in fact, not born on sporophores, as in *Lycoperdonaceæ*, but are contained in globose asci or sporangia, as in *Tuber*. It is to be regretted that M. Vittadini does not appear to have been well supplied with authentic specimens of the more northern mycologists, and in consequence there is some difficulty in ascertaining the synonyms. Our two species of *Elaphomyces* are, however, clearly recognizable in *Elaphomyces variegatus*, Vitt., which is our *E. muricatus*; and *E. asperulus*, Vitt., which is *E. granulatus*. Vittadini appears to have been the first person who ascertained the true structure of the *Lycoperdonaceous* group in Bovista, though he was scarcely aware of the great importance of the fact before him, which arose partly perhaps from misapprehension, in common with all mycologists at the time, of the structure of the hymenium in *Hymenomycetes*. Klotzsch, indeed, has thrown fresh light in Dietrich's 'Flora Regni Borussici' upon the *Hymenomycetous* genera of the monograph. We most cordially recommend it to the notice of British mycologists, and hope that it may be the means of bringing to light some of the hidden treasures of our woods and plains.

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Part III.

On the development of the Sporidia in *Anthoceros lævis*; by Prof. Mohl.—Appendix to the observations on the Air-cell-hairs in *Limnanthemum* and *Villarsia*; by Dr. S. F. Hoffman.—Observations on American *Bauhiniæ*; by Dr. Vogel.—Synopsis of Scandinavian *Drabæ*; by A. E. Lindblom.—Notice of Hampe's Cellular Plants of Germany.

Part IV.

On a new species of *Waldsteinia*; by Dr. Koch.—On the Vegetation of the source of the Antritz near Grätz; by Dr. Unger.—On *Saracha* and *Physalis*; by Prof. Bernhardi.—Supplement to Account

of the Flora of Hercynia; by E. Hampe.—Vegetation of the Brocken; by E. Hampe.—On the genus *Grubbia*, Endl.; by Klotzsch.—On Monstrosities of Plants; by Schlechtendal.—Prodromus of a monograph of *Lemnaceæ*; by Dr. Schleiden.—On two remarkable transformations of Plants; by Weinmann.—Request to German botanists to supply desiderata in the genus *Artemisia*; by W. D. Besser.—On Mexican Plants collected by Schiede and others; by D. F. L. De Schlechten.—On the irregular form of Papilionaceous Flowers; by A. Walpers.

PART V.

Critical Remarks on Cape *Leguminosæ*; by G. W. Walpers.—On some phænomena in the growth of Dicotyledonous Plants; by Dr. Beeks.—On Mexican *Galphimiæ*; by F. T. Bartling.—On *Pinus Pumilio*; by H. R. Göppert.

PART VI.

On the family of *Piperaceæ*; by C. Kunth.

PROCEEDINGS OF LEARNED SOCIETIES.

BOTANICAL SOCIETY OF LONDON.

March 20.—Daniel Cooper, Esq., Curator, in the Chair.

A paper was read by Dr. W. H. Willshire, "On the nature of some of the lowest Organized Beings." The intention of the paper was to bring before the Society the views lately advanced by Ehrenberg, in his great work concerning the organization and relative place in the scale of animated nature of many of the tribe *Bacillaria*, *Closterina*, &c. It was endeavoured to be proved that a great many members of the family *Bacillaria*, the genus *Closterina*, and several others, must be considered as of a vegetable nature, and not of an animal, as Ehrenberg supposes, and that it is a matter of some doubt how far the members ranking under his sub-division *Naviculacea* may be considered as of an animal organization either. It was shown by Dr. Willshire that the phænomenon of self-division is not peculiar to the animal kingdom, but that it likewise occurs in that of the vegetable; that the whorled ramuli of *Chara* can increase both by transverse and longitudinal self-division; that the formation of spores in *Marchantia*, *Jungermannia*, and some other plants, takes place from self-division of the original cellule; and that the increase of *Conferva glomerata*, &c. is also known to ensue by the same means; and that therefore the mere fact of this mode of propagation in such structures as *Diatoma*, *Fragillaria*, *Desmidium* and others, is not a sufficient proof of their animal condition. It was stated likewise that granular matter, seen within many of these lower beings, and which is regarded by Ehrenberg in many cases as the ova granules or eggs of these creatures, cannot be such; for according to other observers, they become *blue* on the addition of the tincture of iodine, a further proof of their vegetable nature, and a fact particularly noticed by

Meyen in respect to *Euastrum* and *Closterium*; that the mere dissolution from some of these lower beings of moving sporules, or at least mobile portions capable of increase of form and size, is not a proof of the animal condition of the parent bearing them, because from the observations of Vaucher, Lamoureux, Montaigne, and especially the younger Agardh, we may safely conclude that the sporules of a very great many *Algæ*, when ripe, are endowed with the faculty of locomotion; and that this not only takes place when such portions become freed from the mother plant, but in some cases also whilst they are within the interior of the cellules; also, that the fact of locomotion is not a proof at this low extremity of the scale of animal conditions, as we know that it takes place in structures allowed by Ehrenberg himself to be of vegetable nature, such as the *Oscillatorias* and *Zygnemas*: and that Ehrenberg's opinion, that the motion seen taking place in *Oscillatoria* is caused by rapid growth of the filaments, formation of gemmæ, and stimulus of light, is ably and sufficiently disproved by the experiments of Capt. Carmichael; and also, that as we cannot in the present state of our knowledge say that the attainment of a particular *result* from the occurrence of motion, as more apparently ensues in the *Naviculas* than in the *Oscillatorias*, is indicative of animal conditions, because *result* or *purpose attained* is equally observable in the movements of *Zygnema* or even in *Vallisneria*, and the motions of many irritable stamens; it seems to be highly probable, that many of these almost invisible organisms hitherto freely yielded up by the botanist to the zoologist, must not be considered as indisputable claims for such distinction, although they may not appear at once so decidedly vegetable as do *Diatoma*, *Fragillaria*, *Desmidium*, *Closterium* and others.

The paper was concluded with some remarks on the genus *Navicula*, and illustrated with specimens under the microscope of the various genera, together with a series of diagrams.

April 3.—J. E. Gray, Esq., F.R.S., &c., President, in the Chair.

The Secretary announced a donation of a very extensive collection of Foreign Plants, presented by Mr. Emerson through Mr. John Morris. A paper was read from Mr. Riley of Papplewick, Notts, being introductory to a series, which will form a popular "Monograph on Ferns."

June 5th.—D. C. Macreight, M.D., V.P., in the Chair.

A donation of American Plants from Dr. Gavin Watson of Philadelphia, U. S. was announced. Mr. Tatham, of Settle, Yorkshire, presented specimens of *Dryas Octopetala* obtained from the hills in that neighbourhood. Mr. H. M. Holman, of Reigate, Surrey, forwarded living specimens for distribution of the rarer plants of that locality, comprising *Aceras anthropophora*, *Ophrys muscifera*, *Osmunda regalis*, &c. &c. A paper was read, being Part 3. of a Monograph of Ferns. It comprised a description of the British species individually; the remarks being the result of many years personal experience, the author having cultivated every British species side

by side, and watched their specific differences with great care and attention. Mr. Thomas Sansom exhibited a proliferous specimen of *Polytrichum commune*, in which a second stem was developed in the place of the stalk bearing the fructification.

ZOOLOGICAL SOCIETY.

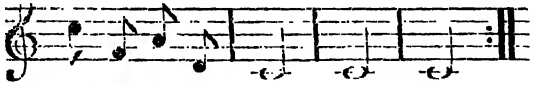
Feb. 11, 1840.—The Rev. J. Barlow in the Chair.

Mr. G. T. Lay read the following account of the habits of a Bird of Paradise, *Paradisea apoda*, Linn.:—

"This bird has been in the possession of Mr. Beale upwards of fourteen years, and seemed when I left China at the commencement of the past year to be in full health and vigour. It is fed mainly upon boiled rice, with a few grasshoppers, as meat with its vegetables. These it eats whole when small, but pulls off the legs and wings when large. The tip of the abdomen, with the lower intestine, are rejected, while the rest of the viscera are devoured as a sort of choice morsel. It seizes the insect near its head with so firm a gripe, that life is soon extinct, which answers the double purpose of securing its prey and of shortening the dying throes of the poor victim. It is very careful to cleanse its bill after every such operation, wiping it upon the perch, and shaking it with a peculiar jerk. I have heard one remark that it is not a clean feeder, but this is true only of the mode of eating, which is gross and eager, as the largeness of the mouthful is incompatible with much grace or nicety in conveying the food to the place of its destination.

"The voice is loud and sonorous when he calls in a rapid succession of notes. This is probably the strain in which he answers his fellows in the wild state, and may be heard, from its clearness, a great distance, where walls and dwellings do not interfere with the pulsations. When you approach his cage he often treats you with a ditty, which I have called in my memorandum 'the song of solicitation.' It is short, but very pleasing, and not a little curious, for the notes are repeated in harmonic progression.

"*The Serenade of Beale's bird.*



"The first four notes are very exactly intonated, very clear, and very sweet. The three last are repeated in a kind of caw, a very high refinement of the voices of a daw or a crow, yet possessing a striking resemblance. And this suggests a lively affinity between the crows and the paradise birds. While this serenade is uttered, the black pupil, encircled by a golden iris, waxes or wanes, as the creature wishes to contemplate more distant or nearer objects. The bill snaps as the prelude of a meal and the token of appetite, while the body is conveyed from side to side by the highest and most easy springs. The crow and its congeners love to range upon the ground,

as having feet formed for walking, but the Paradise Bird shuns the bottom of the cage, as if afraid of soiling its delicate plumage; for I must observe, that it is always as clean and wemless as it is gay and splendid. The Creator, who has poured so much beauty upon it, has also endowed it with an instinct to delight in these charms, and with wisdom to preserve them in their fullest integrity. In the wild state it is not unlikely that they catch their prey upon the wing, either by taking it in flight, like the swallow, or by darting upon it, like the Drongo Shrike, as it passes by the seat of its pursuer.

"The form and disposition of the pennons afford it the power of floating gracefully upon the breeze, not of cutting the air in rapid flight. The ease with which it glides upon the auræ must be increased by the hypochondrial feathers, which are lifted up and displayed in the act of flying. The hypochondrial feathers are yellow at the base, whitening towards the end, with brown shafts. The shortness of the vanes makes them resemble the teeth of a saw near the end. The tail-coverts with long toothed shafts. The feet and legs are of a dark leaden blue. They are strong, and grasp the perch with great ease and firmness."

Mr. Fraser pointed out the characters of several new species of Humming-birds, which had been placed in his hands by the Earl of Derby for that purpose, and that they might be exhibited at one of the Society's scientific meetings. These birds were obtained at S^ta^ Fé de Bogota, and the collection contained eighteen species, a great portion of which being undescribed, were thus characterized:—

Trochilus exortis. *T. rostro quàm caput paululùm longiore; caudâ nigrescente, latissimâ, subfurcatâ; colore viridi; pectore cæruleo enitente; maculâ frontali splendidè viridi; laciniis gulari purpurascenti-rubrâ nitore cæruleo; menti plumis cæruleis; crisso albo.*

Long. tot. 4 unc.; *rostri*, $\frac{3}{4}$; *alæ*, $2\frac{1}{2}$; *caudæ*, $2\frac{1}{8}$.
Hab. Guaduas, Columbia.

This species is of moderate size; the general colour of its plumage is deep rich green, with bronze reflections; the wings are dusky, with the upper and under coverts of the same green tint as the body: the two central tail-feathers are tinted with bronze, both above and beneath; the remaining tail-feathers, which are broad, are black, but in certain lights a very obscure purplish-green hue is observable; the feathers on the forehead are more compact than the remaining feathers of the head; in some lights they appear to be of a black colour, edged with green; in others they exhibit a most brilliant green lustre.

Trochilus cupreo-ventris. *T. rostro quàm caput paululùm longiore; caudâ brevi, subfurcatâ: femoribus albis; colore splendidè viridi, aureo et cupreo enitente; crisso purpurascenti-cæruleo; primariis nigrescentibus; caudâ nigrâ, purpureo tinctâ.*

Long. tot. $4\frac{3}{4}$ unc.; *rostri*, 1; *alæ*, $2\frac{3}{8}$; *caudæ*, $1\frac{7}{8}$.

This species is remarkable for the richness of its colouring; in

certain lights it appears as if it were powdered with gold and copper-coloured particles; the coppery hue prevails most on the belly; and the upper tail-coverts are of a purer green than other parts.

Another blue-vented and white-thighed Humming-bird was described under the name of

Trochilus uropygialis. *T. rostro quàm caput longiore; caudâ mediocri, furcatâ: colore corporis intensè viridi, aureo relucente; rectricibus caudæ fulgidè aureo-viridibus; gulâ crissoque ex purpureo splendidè cæruleis; abdomine nitidè viridi; alis nigrescentibus; caudâ ex purpureo atrâ; plumis femoralibus albis, laxis.*

In the female the throat and chest are somewhat rusty, with green spots, and the feathers on the belly are variegated with whitish.

This species is about the same size, and in many respects resembles the *T. cupreo-ventris*, but differs in having the general colour less brilliant, whilst the feathers of the belly and the upper tail-coverts are more brilliant, and present that compact striated appearance which is always observable in those feathers which give that extreme brilliancy to different parts of these birds: it differs, moreover, in having a blue throat, and the belly, instead of being cupreous, is bluish-green. The upper tail-coverts in *T. cupreo-ventris* are of the same loose character as those on the back.

Trochilus coruscus. *T. rostro brevi; caudâ latissimâ, subfurcatâ, ex æneo fuscâ: corpore suprà, capiteque viridibus nitore aureo; tectricibus caudæ cupreis; primariis purpurascentibus; corpore subtùs viridescente, fuscescenti-ochreo, præsertim ad crissum, tincto; lineâ gulari, ad pectus tendente nitidè viridi, apice purpurascenti-rubro.*

Long. tot. 5¼ unc.; *rostri*, ¾; *alæ*, 2⅞; *caudæ*, 2⅛.

Beak about equal to the head in length; tail slightly forked, the feathers *very* broad; general colour of upper parts green, with golden reflections, upper tail-coverts coppery; under parts dull brownish-green; tail-feathers above and beneath rich bronze, with golden brown reflections; primaries dusky, with purple reflections: a stripe, extending from the chin to the chest, is composed of compact brilliant feathers; those on the chin and throat are green, and those beyond are purplish-red, exhibiting bluish reflections; under tail-coverts brownish-yellow; some of the feathers are whitish; the feathers on the edge of the shoulders are varied with brownish-ochre.

The female is deficient of the flame-like mark on the throat.

Trochilus brachyrhynchus. *T. rostro quàm caput breviore; caudâ brevi, nigro, cupreo et æneo subnitente; rectricibus utrinque duabus externis cæteris paululùm præstantibus, et ad apicem albis: corpore suprà, ex aureo viridi, corpore subtùs albo (interdùm flavido lavato), maculis ex aureo viridibus ornato; primariis purpurascentibus.*

Long. tot. 3 $\frac{5}{12}$ unc.; *rostri*, ⅓; *alæ*, 1⅞; *caudæ*, 1 $\frac{7}{12}$.

In one specimen there is a rufous tint on the upper tail-coverts;

in another there are several purple feathers irregularly scattered with the ordinary golden green ones on the back; perhaps in the adult bird this purple is the prevailing colour of the back.

This small-sized species is remarkable for the shortness of its beak, which is acutely pointed, and a little dilated in the middle.

Trochilus Derbianus. *T. rostro recurvo, quoad longitudinem, corpus cum capite æquiparante; caudâ mediocri, paululùm furcatâ: colore viridi, corpore subtùs albido variegato; gulâ nigrescente.*

♂ Long. tot. 8 unc.; *rostri*, 3⅜; *alæ*, 3; *caudæ*, 2¼.
♀ ——— 7¼ ———, 2¼; —, 3; ——, 2.

Bill immensely long, and somewhat recurved, equal in length to the head and body; tail moderate, slightly forked; head and upper parts of body green, with golden and bronze reflections; wings purplish-black; tail blackish, tinted with bronze, the central feathers being the richest; chin and throat dusky, each feather very obscurely tinted with bronze in the middle, and edged with ashy-white; belly and vent green; the feathers edged with white, or in parts greyish, those on the chest are whitish, with a large green spot near the apex; under wing-coverts green.

The female has a shorter beak; and there is more white on the under parts of the body; the feathers on the throat and chin are somewhat variegated with yellowish.

Trochilus aurogaster, Loddiges' MSS. *T. rostro ferè duplo quàm caput longiore; caudâ mediocriter latâ et furcatâ; plumis corporis permagnis, et suprà et subtùs: colore splendidè viridi; tectricibus caudæ plumisque abdominis nitidè aureo relucentibus; notâ gulari purpureo-cæruleâ, necnon apud frontem notâ, luce favente, gramineo-viridi; crissi plumis aureo-viridibus, ferrugineo marginatis; alarum primariis fuscescenti-nigris non sine æneo nitore; caudâ ex-aureo-æneo-viridi.*

In the female the throat is of a rusty yellow tint, and is sparingly spotted with green; the belly and vent are of an ochreous colour, with heart-shaped green spots; on the former the green predominates, and on the under tail-coverts the yellowish tint prevails.

This species is of moderate size; that portion of the under mandible which shuts into the upper one is white.

Trochilus fuscicaudatus. *T. rostro quàm caput longiore; caudâ subrotundatâ: colore ex aureo viridi; plumis gulæ, pectoris, et abdominis, albido marginatis; plumis analibus albis; crisso fusco, rectricibus caudæ submetallicè castaneis, nigrescente marginatis; remigibus alarum nigrescentibus, purpureo paululùm relucentibus; mandibulâ inferiore (apice excepto), necnon superioris basi, pallidè fuscis.*

Long. tot. 4 unc.; *rostri*, ⅞; *alæ*, 2; *caudæ*, 1½.
Hab. Chachapayas, Peru.

Trochilus cyanopterus, Loddiges' MSS. *Tr. rostro quàm caput multo longiore; caudâ latissimâ et leviter furcatâ: colore intensè viridi, ad nigrum hìc atque illìc vergente, præsertim apud caput;*

primariis tectricibusque alarum metallicè cæruleis, illis ad apices marginesque nigrescentibus; caudâ nigrescente, viridi tinctâ; alis subtùs cærulescentibus.

This is a very large species, being nearly equal in size to the *T. gigas*; its deep green colouring and blue wings render it easily distinguished; the female differs considerably from the male, inasmuch as nearly the whole of the under parts of the body are of a rust-like tint; the two outer tail-feathers are of a blackish colour, but have a white shaft; the outer web is grayish-white, excepting at the margin and at the apex of the feather; the outer edge of the first primary is palish.

Trochilus Gibsoni, Loddiges' MSS. *T. rostro quàm caput longiore; caudâ mediocri, rotundatâ: corpore suprà, sic et rectricibus caudæ duabus intermediis aureo-viridibus; corpore subtùs albo; plumis gularibus magnis, strophium efficientibus, purpureo relucentibus; rectricibus caudæ utrinque tribus, exterioribus, ad basin cinerascentibus, apicibus albis.*

Long. tot. $2\frac{7}{8}$ unc.; *rostri*, $\frac{7}{8}$; *alæ*, $1\frac{3}{4}$; *caudæ*, $1\frac{1}{8}$.

Hab. ——?

The green on the upper parts of the body of this little species is rather paler, and has a greater admixture of the golden lustre, than usual: words can convey no idea of the brilliancy of the large ruff on the throat; in some lights it assumes a deep blood-red hue; in others there is a slight admixture of purple observable; in others, again, they put on a brilliant cupreous-red tint, as we observe in the copper ore.

Trochilus angustipennis. *T. rostro quàm caput paulùm longiore; caudâ leviter furcatâ, hujus rectricibus, necnon remigibus alarum, valdè arctis: capite corporeque suprà intensè æneo-viridibus; guld et corpore subtùs, plumis albis analibus exceptis, aureo-viridi metallicè relucentibus; alis caudâque intensè purpureis.*

Long. tot. $3\frac{1}{4}$ unc.; *rostri*, $\frac{3}{4}$; *alæ*, $1\frac{3}{4}$; *caudæ*, $1\frac{3}{8}$.

This small-sized species has the wing and tail-feathers narrower than usual.

Trochilus parvirostris. *T. rostro parvisculo, acuto, quàm caput breviore; caudâ leviter furcatâ, mediocri, rectricibus sub-latis: capite corporeque suprà aureo-viridibus, in obscurum transeuntibus; frontis plumis ochreo pallidè lavatis; corpore subtùs flavescenti-albo; gulæ plumis singulis maculâ obscurâ; abdomine sordidè ochreo, plumis singulis maculâ magnâ, obscurè viridi; plumis analibus albis; crissi plumis obscuris, apicibus albis; caudæ rectricibus, æneo-viridibus suprà, subtùs aureo-æneis, scapis albis; rectricum tribus utrinque externis, lineâ centrali albâ, in externâ utrinque hâc lineâ extensâ, ferè ad marginem; alis obscuris, purpureo subtùs, paulùm relucentibus.*

Long. tot. $4\frac{1}{2}$ unc.; *rostri*, $\frac{1}{2}$; *alæ*, $2\frac{3}{8}$; *caudæ*, 2.

This is in all probability a young bird, or perhaps a female of some species, the male of which remains to be discovered; the yellow

white, or cream-colour of the lower part of the throat extends in a narrow line across the back of the neck.

Trochilus flavicaudatus. *T. rostro quàm caput duplò longiore et arcuato; caudâ mediocri: capitis vertice obscurè fusco; corpore suprà aureo-viridi, corpore subtùs ochreo; gulæ plumis punctis aureis et cupreis; pectoris lateribus maculis aureo-viridibus, ornatis; crisso pallidè ochreo; rectricibus caudæ duabus intermediis aureo-viridibus, reliquis ochreis, apicibus viridibus; remigibus alarum obscuris, purpureo relucentibus; rostro nigro; pedibus suprà nigrescentibus, subtùs pallidis.*

Long. tot. $4\frac{3}{4}$ unc.; *rostri*, $1\frac{1}{8}$; *alæ*, $2\frac{1}{2}$; *caudæ*, $1\frac{3}{4}$.

Trochilus melanogenys. *T. rostro quàm caput vix longiore; caudâ sub-brevi, rectricibus mediocriter latis, et acutis: capite et corpore suprà aureo-viridibus; corpore subtùs ex-ochreo-albo; abdominis lateribus rufo lavatis; genis nigris; lineâ flavescenti-albâ pone oculos; plumis gulæ singulis notâ ad apicem nigrâ, notis lineas longitudinales efficientibus; abdomine, obscurè, aureo-viridi guttato; caudâ suprà nigrescente, æneo tinctâ, apicem versus nigrâ purpureo relucente, et rectricibus flavescenti-albo, duabus intermediis exceptis, terminatis; alis obscuris, violaceo relucentibus; mandibulæ inferioris basi, pedibusque flavis.*

Long. tot. $3\frac{3}{4}$ unc.; *rostri*, $\frac{3}{4}$; *alæ*, $3\frac{3}{4}$; *caudæ*, $1\frac{3}{8}$.

Trochilus tyrianthinus, Loddiges' MSS. *T. rostro acuto, caput longitudine æquante; caudâ mediocri, vix furcatâ; rectricibus latissimis: capite, corporeque suprà, aureo-viridibus; sic et corpore subtùs, at ochreo variegato; gulâ nitente, et intensè viridi; rectricibus caudæ suprà æneo-viridibus, ex-aureo, et cupreo relucentibus, subtùs, cupreis, aureo nitentibus; alis obscuris; rostro pedibusque nigris.*

Fœm: *gulâ e castaneo flavâ; abdomine albo, ochreo lavato; singulis plumis notâ aureo-viridi.*

Long. tot. 4 unc.; *rostri*, $\frac{1}{2}$; *alæ*, $2\frac{1}{8}$; *caudæ*, $1\frac{3}{8}$.

MISCELLANEOUS.

NOTICE OF A SPECIES OF WARBLER NEW TO BRITAIN.

Amongst the new specimens of British birds which have been lately presented to the British Museum by Mr. J. Baker, was one that was considered a Reed Wren (*Sylvia arundinacea*), but on comparing it with other specimens it was at once suspected to be a distinct bird; and further, it agreed with none of those at present recorded as being found in this country. On investigation it proved to be a rare species even in the south of Europe, and one that was first noticed by Savi in the 'Nuovo Giornale de Letterati,' Num. XIV. 1824; and again in his 'Ornitologia Toscana,' tom. i. p. 270, under the name of "*Sylvia luscinioides*." It is figured by Savigny in the 'Déscription de l'Egypte,' pl. 13. f. 3, and by Gould in his 'Birds of Europe.' The specimen was obtained, with a second, by the above-

mentioned person last spring in the fens of Cambridgeshire; these were all that were procured.

The following is a short specific description:—

Sylvia luscinioides, Savi (Pseudoluscinia Savi, *Bonap.*).

General colour above castaneous brown, with the tail very inconspicuously barred with darker; line over the eyes, breast, sides and under tail-coverts paler than the upper parts; throat and middle of the abdomen albescent, the former slightly spotted triangularly with darker. The first quill very short, and the second longest of all. Upper mandible brown, lower and feet yellowish brown.

Total length, $5\frac{1}{4}$; bill, $\frac{3}{12}$; wings, $2\frac{1}{2}$; tail, $2\frac{1}{4}$; tarsi, $\frac{9}{12}$.

GEORGE ROBERT GRAY.

PHYSOPHORES.

Mr. Milne Edwards believes that these are not single animals, but the aggregation of a great number of individuals growing by buds, and living united together like the compound *Polypes.*—*Edwards, Ann. Sc. Nat.* 1840.

ECHINIDÆ.

Mr. M. Edwards and Dr. Peters have discovered that the *Echinidæ* are of separate sexes: the testicles differ little from the ovaries, but they contain a white milky fluid, while that of the ovaries is orange. —*Edwards, Ann. Sc. Nat.* 1840, p. 196.

CARINARIA.

According to Mr. Edwards, the nervous system is much more complicated than in any other Gasteropodes; besides the labial ganglions, the cerebral, and the subœsophageal, there are a pair of optic ganglions, a pair of ophthalmic, a pair of hepatic and a subanal ganglion. Lastly, they have stomato-gastric nerves analogous to those which have been observed in Crustacea, and in many other invertebrated animals.—*Ann. Sc. Nat.* 1840, p. 196.

HISTORY OF MOLLUSCA.

M. De Blainville has lately published some extracts from M. Dufo's observations on the habits of mollusca; in which he remarks that this gentleman has observed that the eggs of *Achatina Mauritiana* are disposed in the form of a column, forming a more or less lengthened series; that *Helix unidentata* and *H. Studmanni* are ovoviviparous; that some species of *Calyptræa* are provided with a support distinct from the rock on which they are placed; that *Hipponyx* sometimes hollows out the surface of the bodies to which it is attached; and that the *Byssiferous bivalves* sometimes detach their byssus thread by thread. These remarks with regard to the *Calyptræa* are very interesting, as showing the affinity of the animal to the *Hipponyces*, which have been proposed to be placed with the bivalves. The observations with respect to ovoviviparousness of some *Helices* and the habits of the *Hipponyces* are not new to English malacologists.—J. E. GRAY.

THE GENUS *BROCCHIA* OF BRONN.

In the Philosophical Transactions for 1833, p. 78, I stated that I believed that this genus had been established on specimens of *Capuli* that had been affixed to radiated shells. M. Philippi, in his excellent work on Sicilian Shells, observes, "Non in testa plicata differentiam genericam quæsivit cl. Bronn, sed in sinu laterali, et *Brocchia* eodem charactere a *Capulis* quo *Siphonaria* a *Patellis* differt," p. 119. On re-examination of the species I find nothing to distinguish it from *Capulus* but the lateral notch, which varies greatly in size in the different specimens, and appears to be formed by attachment to some extraneous body. M. Philippi however copies Professor Bronn's character without discovering that it contains two very obvious inaccuracies, which, if they were true, would at once separate the genus from *Capulus* and all the other known Molluscous genera: for he says, "Impressio muscularis elongata arcuata transversa intus ad limbum anticum." Now I know no univalve shell that has the muscular scar on the front of the mouth! The fact is, that the Professor has mistaken the front of the shell for the back, and this has led to the other mistake; for he describes the mouth thus, "apertura subrotunda, *margo sinister sinu amplo excisus*," whereas the nick is not on the left but always on the right side of the shell when present. I may further observe, that the right limb of the muscular impression behind the neck is much shorter than the left; or rather, the apex of the shell, which in *Pileopsis hungaricus* is nearly in the centre of the back of the shell, is in *P. sinuosa* on the right side of the back. The shell is dextral, though it has at first sight the appearance of being sinistral.—J. E. Gray.

"THE SEXES OF LIMPETS. PATELLÆ."

In the last Number (p. 70.) Dr. Wagner refers to the fact of the *Patella* being unisexual as a discovery of his own. It will be found stated with more detail in the first volume of the Annals, p. 482.—J. E. Gray.

THE EXHIBITION OF FISHES IN MUSEUMS.

In the Royal Museum of Vienna, where they have the best-preserved and exhibited collection of fishes that I have ever seen in any public Museum, the specimens are kept in shallow cases about six or eight inches deep, and are suspended by a wire loop which is inserted into the back of the specimens just before the front of the dorsal fin. If the specimen is long and heavier behind, so that it will not keep its position, there is driven in a small pin just beneath the lower side of the base of the tail to support it. In this manner the fishes appear in the attitude of swimming, and their names are easily attached to the back of the case beneath them; they are also easily taken off the pin to which the loop is suspended, if necessary for examination.—J. E. Gray.

MR. HECKL'S METHOD OF CLOSING GLASS JARS.

The specimens of fish in the Museum of Vienna which are kept in spirits are inclosed in glass jars covered with a flat glass disc; these discs are made at the same time as the bottles and sent in with them from the Bohemian glass-houses. They and the surface of the lips of the jars are ground together so as exactly to fit each other, and they have an oblique edge shelving towards the inner side, so that when they are placed on the top of the jar there is a small triangular space all round between the upper edge of the disk and the upper outer edge of the lip of the jar, which is left to hold a quantity of the composition by which they are luted. This composition consists of six ounces of white wax and three drachms each of spermaceti and hog's lard mixed together; and Mr. Heckl, who has made many experiments, assured me, that if it was well applied between the two surfaces and filled into the triangular space above referred to, not the least evaporation was observable in bottles that had been set aside for the purpose for more than two years, though some of them had been set upside down to bring the spirit in connexion with the mixture. Indeed so much confidence has Mr. Heckl in the method, that he has had the disk pierced with a small central slit to enable him to support his specimens with silk, only having a small concavity ground out of the upper surface of the disk round the hole, which he fills with this composition. There is a specimen jar of the kind in the British Museum.—J. E. Gray.

STANDS FOR BIRDS, &c.

In the Vienna Museum the newer specimens of Birds and the smaller mammalia are placed on stands with oval bases; this is far superior to the round or square bases which are usually adopted in English and French collections, as it gives a larger space for the label without occupying more room, which is often much wanted, and at the same time prevents the birds being knocked against each other by accident.—J. E. Gray.

THE GENUS *GYNAMEDA*, GRAY.

The body which I described under this head in Proceedings of the Zoological Society, is evidently only the basal joint of the body of the English species of *Comatula*, the impressed dots on the convex part being the scars left by the dorsal claspers; and the single opening and the cavity in the flat part are doubtless analogous to the roundish or five-rayed cavity in the joints of the stem of the Enirmitis. This fact I have verified by comparing the specimens I described with one of those joints separated from a complete specimen, but it is curious how the two specimens which were described should have been found so completely isolated in the sand; for I had great difficulty, even after soaking the specimen in water for some days,

to separate this joint from the rest of the body, and at last could not do it without breaking part of its edge and some of the other pieces. I have no doubt, after examining the specimens of Dr. Goldfuss's genera *Coniotremites* in the Museum at the University of Bonn, that they also equal the basal part of the body of some fossil Ecrimites as M. Agassiz has already suspected, the five holes round the mouth being similar to the five rays sometimes found in the stem of some species of *Crinoidea*.—J. E. Gray.

The Epiphragma of *Achatina*.

The Epiphragma of the larger species of *Achatina* (as *A. Mauritiana*) is thin, hard and calcareous, and marked with a long linear impression near the outer hinder angle of the aperture over the respiratory hole of the animal.—J. E. Gray.

The Hoopoe.

A fine specimen of the Hoopoe (*Upupa epops*, Linn.) was shot on Skelcoat Moor, near this town, on the 3rd instant, and is now in my possession.—R. Leyland.

Halifax, Sept. 16, 1840.

Meteorological Observations for Aug. 1840.

Chiswick.—Aug. 1, 2. Very fine. 3—9. Hot and dry. 10. Very fine. 11. Showery. 12. Cloudy: rain. 13. Cloudy. 14. Rain. 15. Very fine: showery. 16. Fine. 17. Boisterous with heavy rain. 18. Cloudy. 19. Heavy rain: cloudy and fine. 20. Fine. 21. Foggy: very fine. 22. Foggy. 25—26. Very fine. 27. Foggy: fine. 28. Slight fog: rain. 29. Foggy. 30, 31. Cloudy and fine. The mean temperature of the month was nearly 2° above the average.

Boston.—Aug. 1—3. Fine. 4. Cloudy. 5—10. Fine. 11. Rain. 12, 13. Fine. 14. Cloudy. 15. Stormy: rain P.M. 16. Fine. 17. Stormy: rain early A.M.: rain with thunder and lightning P.M. 18. Stormy. 19, 20. Cloudy. 21. Fine: quarter past three P.M. thermometer 80°. 22. Cloudy: rain P.M.: lightning at night. 23, 24. Fine. 25. Fine: rain P.M. 26, 27. Cloudy. 28. Fine. 29. Cloudy. 30. Fine: rain P.M. 31. Cloudy: rain A.M.

N.B. The warmest August since 1826.

Applegarth Manse, Dumfries-shire.—Aug. 1, 2. Very fine. 3. Mild: showery A.M. 4. Fine. 5. Sultry. 6. Sultry: heat oppressive. 7—9. Sultry. 10. Wet and boisterous P.M. 11. Showery. 12—14. Occasional showers. 15. Fair throughout. 16. Much rain P.M. 17. Heavy rain: thunder: high flood. 18. Fine drying day. 19. Fine, with one slight shower. 20. Drizzling all day. 21. Fine: rain P.M. 22, 23. Fine and fair all day. 24, 25. Showery. 26. Fair all day and clear sky. 27. Wet P.M. 28. Fair all day. 29. Drizzling all day. 30. Fine and fair all day. 31. Remarkably fine harvest day.

Sun shone out 27 days. Rain fell 15 days. Thunder 1 day.

Wind north-west 5 days. East-south-east 1 day. South-east 4½ days. South 7 days. South-south-west 4 days. South-west 8¼ days. Variable 1 day.

Calm 12 days. Moderate 11 days. Brisk 5 days. Boisterous 3 days.

Mean temperature of the month.....	57°·60
Mean temperature of August, 1839	55 ·70
Mean temperature of spring water	52 ·33

Meteorological Observations made at the Apartments of the Royal Society by the Assistant Secretary, Mr. ROBERTON; *by* Mr. THOMPSON *at the Garden of the Horticultural Society at Chiswick, near London; by* Mr. VEALL *at Boston, and by* Mr. DUNBAR *at Applegarth Manse, Dumfries-shire.*

Days of Month. 1840. Aug.	Barometer.						Thermometer.									Wind.				Rain.				Dew point.
	London: Roy. Soc. 9 a.m.	Chiswick.		Boston. 8¾ a.m.	Dumfries-shire.		London: Roy. Soc.			Chiswick.		Boston. 9¼ a.m.	Dumfries-shire.			London: Roy. Soc. 9 a.m.	Chiswick 1 p.m.	Bost.	Dumfries-shire.	London: Roy. Soc. 9 a.m.	Chiswick.	Boston.	Dumfries-shire.	Lond.: Roy. Soc. 9 a.m.
		Max.	Min.		9 a.m.	9¼ p.m.	Fahr. 9 a.m.	Self-register. Max.	Min.	Max.	Min.		Max.	Min.										
1.	30·278	30·205	30·133	29·65	30·06	30·00	63·7	72·6	53·2	73	46	64	67	50		NW.	NE.	NW.	SW.	...	...	...	...	56
2.	30·254	30·171	30·135	29·55	30·00	30·00	66·7	79·0	55·3	83	51	69	66	52		S.	W.	W.	SW.	...	...	...	...	60
3.	30·244	30·161	30·088	29·53	29·97	30·00	70·0	79·3	61·6	87	48	70	68	53½		S.	NW.	W.	SW.	...	...	...	...	62
4.	30·188	30·117	30·082	29·50	30·04	30·05	67·5	80·0	61·0	86	56	69	67	55		NW.	E.	calm	SW.	...	...	...	...	58
☽ 5.	30·150	30·081	29·991	29·52	30·06	30·05	67·2	68·5	59·0	82	55	71	75	53		SE.	E.	E.	NE.	...	...	...	...	61
6.	30·034	29·959	29·917	29·44	30·04	29·98	69·6	73·0	60·0	84	62	68	73	54		ENE.	E.	E.	SE.	...	...	...	...	60
7.	30·020	29·991	29·930	29·40	30·00	30·05	71·3	78·5	64·0	80	56	70	73	54½		NE.	E.	E.	SE.	...	...	...	0·03	61
8.	30·150	30·129	30·068	29·54	30·12	30·14	65·4	76·0	59·0	80	41	67	73	55½		NNE.	E.	calm	SE. SW	...	...	...	...	59
9.	30·292	30·223	30·106	29·65	30·18	30·10	60·2	75·5	52·4	83	51	67	73½	53		N.	NE.	calm	S.	...	...	...	...	54
10.	30·098	30·052	29·779	29·42	29·84	29·49	69·5	77·0	60·0	86	58	67·5	64	52		SW.	S.	calm	S.	...	·07	...	...	58
11.	29·614	29·566	29·516	28·94	29·40	29·40	63·5	79·7	62·0	85	55	60	64	52		S.	W.	S.	S.	·058	·07	·06	..	60
12.	29·654	29·589	29·555	29·00	29·38	29·30	65·5	70·5	57·0	73	51	63	60	56		WSW.	W.	NW.	S.	·069	·02	·13	..	57
○ 13.	29·656	29·592	29·551	29·03	29·32	29·35	63·0	70·0	55·0	73	49	59	63½	46		SW.	SW.	W.	SW.	·027	·03	...	...	54
14.	29·530	29·672	29·479	28·97	29·31	29·36	61·0	70·0	56·0	66	50	55	62	51½		W.	SW.	calm	SW.	·058	·06	...	...	54
15.	29·818	29·663	29·752	29·17	29·50	29·66	61·2	67·0	53·5	59	51	60	63½	52		SW var.	SW.	W.	NW.	·213	·03	...	0·77	54
16.	29·968	29·911	29·750	29·35	29·64	29·30	65·0	67·5	54·5	73	54	63	59½	51½		W.	W.	W.	SW.	·072	·22	·13	...	55
17.	29·206	29·326	29·169	28·66	28·81	28·70	59·8	72·0	58·0	63	49	57	61	50½		SE var.	SW.	S.	S.	·159	·47	·18	...	59
18.	29·374	29·654	29·315	28·66	29·19	29·45	59·5	63·2	52·5	62	50	58·5	63½	48		W.	SW.	NW.	NW.	·175	·38	·40	...	54
19.	29·712	29·799	29·661	29·11	29·52	29·66	57·0	63·8	57·0	70	56	56	64	51½		SE.	W.	calm	SSW.	·369	·24	...	...	57
☾ 20.	30·016	29·957	29·915	29·14	29·69	29·75	66·0	69·0	60·0	79	56	59	64½	53		S.	W.	calm	SE.	·061	...	...	...	56
21.	29·954	29·891	29·775	29·30	29·73	29·68	69·0	70·5	69·0	80	59	71	71½	58		SE.	S.	calm	S.	...	...	...	...	58
22.	29·836	29·818	29·755	29·40	29·68	29·66	63·5	77·8	62·5	76	50	66	67	50½		SW.	W.	calm	NW.	...	...	...	...	62
23.	29·998	29·932	29·893	29·30	29·79	29·83	63·0	72·5	56·0	77	46	65	64½	51		WSW.	SW.	calm	NW.	...	·01	·12	1·77	59
24.	30·050	29·976	29·938	29·42	29·78	29·82	62·5	72·5	55·0	76	43	65	63½	47½		SW.	S.	calm	SSW.	...	...	...	...	57
25.	30·038	29·968	29·907	29·38	29·74	29·75	63·5	73·5	54·4	72	58	63·5	60	48		WSW.	SW.	calm	SSW.	...	...	...	...	55
26.	30·060	30·001	29·964	29·42	29·88	29·88	65·0	73·0	61·0	72	49	62	64	42		NW.	S.	calm	S.	...	...	·03	...	61
● 27.	30·110	30·011	29·936	29·41	29·80	29·80	61·5	70·8	56·7	73	55	66	65½	53		W.	W.	calm	var.	...	...	...	...	59
28.	30·060	30·044	29·991	29·33	29·92	30·00	63·5	72·0	60·0	74	55	68	61	54		W.	W.	calm	SW.	...	·02	...	...	61
29.	30·204	30·140	30·074	29·57	30·01	29·95	60·9	72·0	60·0	73	57	64·5	63½	54		E.	E.	NE.	NW.	·011	...	...	1·12	60
30.	30·128	30·053	29·920	29·45	30·02	30·15	66·8	69·0	58·0	82	58	69	63½	54		E.	W.	calm	SSW.	...	...	...	...	62
31.	30·184	30·116	30·040	29·60	30·18	30·15	63·0	79·5	60·0	74	58	59	64	41½		NE.	NE.	calm	ESE.	...	...	·17	...	59
Mean.	29·964	29·928	29·841	29·31	30·406	29·757	64·3	72·7	57·9	76·00	52·68	64·2	61·7	51·5						Sum. 1·272	1·62	1·22	3·69	Mean. 58

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

XX.—*On the Stinging property of the Lesser Weever-fish* (Trachinus Vipera.). By George James Allman, Esq. *In a Letter to* Wm. Thompson, Esq., Vice-Pres. Natural History Society of Belfast.

Bandon, August 20, 1840.

My Dear Sir,

I have lately had an opportunity of making some observations on the reputed stinging power of the Lesser Weever (*Trachinus Vipera*), and the result, I think, may tend to clear up a point with respect to which much difference has prevailed among naturalists. The older naturalists seem almost universally to coincide with the popular opinion entertained respecting this little fish, and to agree in ascribing venomous properties to the wounds inflicted with its spines. There can be little doubt that the fishes to which the ancients gave the names Araneus, Draco, Dracunculus, and probably some others, were the Greater and Lesser Weevers of our coasts; and to those they invariably attribute poisonous properties. Pliny accuses the Araneus of inflicting dangerous wounds with the spines of its back. After speaking of a poisonous fish which he calls Lepus, he says, "Æque pestiferum animal araneus, spinæ in dorso aculeo noxius*." In another place, speaking of Dracunculus, he tells us that it inflicts poisoned wounds with the spines of the opercula: "Aculeos in branchiis habet ad caudam spectantes, sic ut scorpio lædit dum manu tollitur†." Similar properties are attributed to the dorsal spines of these fishes by Ælian and Oppian. In the following passage from the Halieutics several spinous fishes are grouped together, all of which are described by the poet as inflicting poisoned wounds, though some of them are undoubtedly innocuous, and classed here with venomous fishes, for the same reason which induces our own fishermen to attribute to the

* Hist. Naturalis, ix. 72. † *Ibid.* xxxii. 53.

different species of *Cottus*, and other spiny fishes, poisonous properties. For directing my attention to the passage, as well as for the accompanying translation, I am indebted to the Rev. W. Hamilton Drummond, D.D., to whom much is due for introducing this curious poet to the English reader*.

Κεντρα δε πευκηεντα μετ' ιχθυσιν ωπλισαντο,
Κωβιος, ος ψαμαθοισι και ὀν πετρησι γεγηθε,
Σκορπιος, ωκειαι τε χελιδονες, ηδε δρακοντες
Και κυνες, οι κεντροισιν επωνυμοι αργαλεοισι·
Παντες ατειρηρως ὑπο νυγμασιν ιον ιεντες.

Hal. ii. 457.

"Cruel spines
Defend some fishes, as the Goby, fond
Of sands and rocks, the Scorpion, Swallows fleet,
Dragons and Dog-fish, from their prickly mail
Well named the spinous. *These, in punctures sharp,*
A fatal poison from their spines inject."

None of the older naturalists, indeed, ever think of denying venomous properties to the Weever; it is the dorsal spines, however, which are almost constantly spoken of as the seat of the virus. Willughby says the six dorsal spines are considered venomous, and therefore the fishermen cut them off on taking a fish. He does not, however, think it proved that the poison is confined to these spines.

Universal as was the belief among the ancients of the venomous character of the Weever, the idea seems to be now almost as universally abandoned, and modern naturalists agree almost to a man in considering it a vulgar error, fit only to be placed among the rubbish which recent investigations have been so rapidly clearing away from the science of nature. Cuvier treats it altogether as an error, and even denies the possibility of the Weever inflicting poisoned wounds. Speaking of its spine, he says, "N'ayant aucun canal, ni communiquant avec aucune glande, elles ne peuvent verser dans les plaies un vénin proprement dit†."

Powerful as is this authority, and that of many other of the moderns, I have been notwithstanding induced to come to quite a different conclusion, and to agree with the ancients in ascribing venomous properties to the Weever.

On the 9th of August, 1839, I was wounded near the top of the thumb by a *Trachinus Vipera*, which had just been taken in a seine with herrings, sand-eels, &c. The wound was in-

* See Essay on the Life and Writings of Oppian, by W. H. Drummond, D.D., M.R.I.A., published in Transactions of Royal Irish Academy for 1820.

† Hist. Nat. des Poiss. t. iii. p. 184.

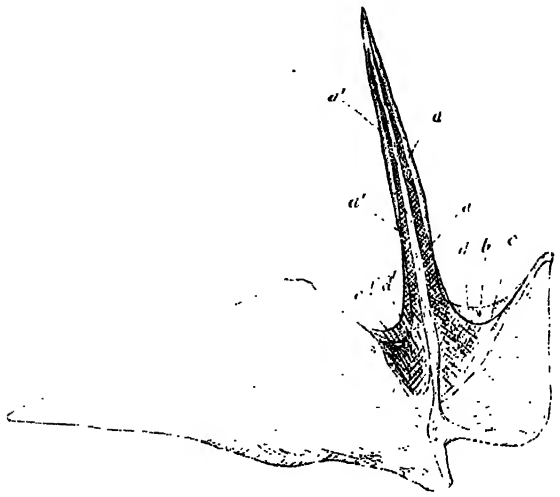
flicted by the spine attached to the gill-covers, during my attempt to seize the fish. A peculiar stinging pain occurred a few seconds after the wound, and this gradually increased during a period of about fifteen minutes. The pain had now become most intolerable, extending along the back of the thumb towards the wrist; it was of a burning character, resembling the pain produced by the sting of a wasp, but much more intense. The thumb now began to swell, and exhibited an inflammatory blush, extending upwards to the wrist. The pain was now distinctly throbbing and very excruciating. In this state it continued for about an hour, when the pain began somewhat to subside, the swelling and redness still continuing. In about an hour and a half the pain was nearly gone. Next morning the swelling of the thumb had but slightly diminished, and was in some degree diffused over the back of the hand; the thumb continued red and hot, and painful on pressure over the metacarpal bone. In a few days the swelling had completely subsided, but the pain on pressure continued for more than a week. No treatment was adopted.

It is here to be remarked, that the wound, of which the above phænomena were the result, was inflicted by the spine of the gill-cover, and not by those belonging to the dorsal fin. Whether, indeed, these latter spines possess any poisonous properties, I have not as yet been able decidedly to determine, though their threatening aspect when erected, and black membrane, present an appearance so formidable, as at once to lead an inexperienced observer to refer to them any stinging power which the little animal may be supposed to possess.

Though I have had no opportunity of making further personal observations on the effects of wounds inflicted by the Weever, facts which fully bear out the conclusions to which my own experience had enabled me to come, have been related to me by witnesses, in whom I can place all possible reliance. A friend informed me that last autumn he saw a woman stung in the hand by one of these fishes; the poor woman immediately uttered loud cries and seemed to suffer great agony, while in an incredibly short time after the wound the hand had become enormously swollen, and exhibited considerable inflammatory redness. No observations were made on the progress of the case.

The spines of the opercula will be found on examination to be deeply grooved along the edges (*a*, *a*, *a'*, *a'*), each groove terminating at the base of the spine in a conical cavity (*b*, *b'*) excavated in the posterior edge of the bony part of the operculum. In the sides of these excavations the edges of the grooves lose themselves, so that there is a perfect continuity between each groove and the corresponding cavity.

From the posterior edge of the operculum the integument is continued over the spine to within a very short distance of



the point; by which means the spine is inclosed in a complete sheath for nearly its entire length, and the groove at each side is converted into a perfect tube, extending from the conical cavity at the base almost to the point of the spine.

The result of this arrangement, is a structure beautifully adapted for the conveyance of a fluid from the base to the apex of the spine.

The spines of the dorsal fin are also grooved, but the grooves disappear towards the base, after becoming superficial, and do not terminate in cavities similar to those at the bases of the spines of the opercula.

I have not as yet been able to detect any specific gland connected with this apparatus. There is, indeed, in the bottom of each of the conical cavities above-mentioned, a small pulpy mass, which may possibly be of a glandular nature; but in ascribing to it the property of secreting the virus, I do nothing more than hazard a distant conjecture. It seems, indeed, to be chiefly composed of fatty matter; and on puncturing my hand with a lancet and introducing a little of this substance taken from a fish which had been about twenty-four hours dead, no phænomena of any interest were the result, there being merely a slight smarting produced, such as might be expected from the introduction of any such extraneous matter into a recent wound, and very different indeed from the intense pain produced by the sting of the living fish. The property of secreting the virus may probably with more truth be ascribed to

the pulpy sheath of the spine; but this, too, is nothing more than conjecture.

This little fish is much dreaded by the fishermen on the southern coast of Ireland; and an opinion prevails among them, that the pain of its sting will last until the tide has again arrived at the height at which it stood when the wound was inflicted. This opinion, which is altogether incorrect, is universally believed by the fishermen of the south of Ireland; and I was surprised to find, from the following passage in Willughby's 'Fishes,' that it is neither confined to any particular district, nor of modern origin: "Dolor ab ictu excitatus (ut nobis retulere piscatores) per duodecem horas durat admodum vehemens, hoc est donec mare novo accessu recessuve ad eundem altitudinis modum seu terminum redeat, deinde paulatim remittit."

Though the Weever is held in particularly bad repute by the fishermen, their terror is by no means confined to it, as the different species of *Cottus*, and some other spiny fishes, are not exempted from the imputation of inflicting poisoned wounds; and many of them are confounded under a common unpronounceable Irish name, which may, I believe, be translated "Sting Devil." These fishes, however, though furnished with formidable spines, appear altogether destitute of any poisonous qualities. I have frequently, indeed, allowed the *Cottus Bubalis* to inflict deep punctures on my fingers without experiencing the slightest unpleasant consequences, beyond those of an ordinary puncture; and it must also be remarked, that the spines of *Cottus*, and of other fishes which I have examined, and which are commonly supposed to be venomous, are of altogether a different structure from those of *Trachinus*, and not at all adapted for the introduction of virus into the wound inflicted by them.

Believe me, dear Sir, very faithfully yours,

GEO. JAS. ALLMAN.

William Thompson, Esq., &c., Belfast.

EXPLANATION OF THE FIGURE.

Right opercular spine of *Trachinus Vipera*, with the sheath removed, viewed upon the external surface, and magnified about six times in linear extent.

a, *a*, *a'*, *a'*. The grooves in the edges of the spine.

b, *b'*. The conical cavities in which the grooves terminate.

c, *c'*. The external walls of the cavities.

d, *d'*. The internal walls.

The parietes of the cavities being transparent, *d'* is represented as visible through the external wall.

XXI.—*Catalogue of Irish Zoophytes.* By Arthur Hill Hassall, Esq., M.R.C.S.L. With 3 Plates.

"It is delightful to see by these miniature existences, small almost to invisibility, and by their careful organization as finely contrived as in the grandest creature, that greatness and littleness make no difference to Him in His Creation or in His Providence. They reveal to us that magnitude is nothing in His sight; that He is pleased to frame and to regard the small and weak as benignly and as attentively as the mighty and the massive. We are high and low, great and small, as to each other, but not to Him."—*Sharon Turner's Sacred History.*

In no part of the animal kingdom is the truth of the above remarks more pleasingly or more beautifully manifested than in the present order; in no other department do we meet with, to an equal extent at least, the same diversity and elegance of form so illustrative of the fertility of invention and beauty of conception of the Divine Mind. The heart must be cold and insensate indeed, that, on beholding these interesting "minims of creation" is not tempted to exclaim with the Psalmist, "in wisdom," beneficent, infinite wisdom, "hast thou made them all."

The whole of the zoophytes enumerated in the following Catalogue, with two exceptions, were found in the bays of Dublin and Killiney during the winter of 1838 and spring of 1839. The extent of coast embraced by these bays is about sixteen miles, abounding more in marine productions than any other known locality of similar dimensions.

The distribution of zoophytes is often extremely local, in many cases a species being restricted to one particular spot of perhaps not more than half a mile or a mile in extent; it is, on this account, that I have given the habitat of each separately.

The law of the spiral development of similar parts, so evident in the vegetable kingdom, is here also very generally manifested both in the form of the polypes as well as in that of the polypidoms—this is particularly remarkable in *Antennularia antennina*, *Thuiaria thuja*, *Campanularia verticellata*, and *Vesicularia spinosa*; and traces of this arrangement may be detected in some part or other of the structure of the majority of zoophytes.

In this catalogue the term Zoophyte is used in the extended signification in which it was employed by Ellis, who embraced in his work the Articulated Corallines and Sponges, denying, however, the existence of polypes in the latter, and

believing in their animal nature from their structure and chemical composition.

I have here to acknowledge the obligation I am under to Dr. Johnston* of Berwick, who kindly afforded me the benefit of his experience wherever I entertained doubts as to the identity of any of the species mentioned, and from whose assistance, in this particular, I am enabled to present this Catalogue with the greater confidence.

RADIATED ZOOPHYTES.

Order I. ZOOPHYTA HYDROIDA.

Tubulariadæ.

Tubularia.

Tubularia indivisa.—Dublin bay; not common.

T. ramea. This is one of the most delicate and arborescent of the corallines, exactly resembling a miniature tree. The ultimate tubes have four or five distinct rings at their base. Polypidom about six inches in height.

On shells from deep water; rare. Blackrock, Dublin bay.

Sertulariadæ.

Thoa.

Thoa halicina. A variety of *T. halicina* is frequently met with, distinguished from the ordinary specimen by its irregular mode of branching.

Dublin bay; common.

T. Beanii. Of this extremely elegant zoophyte I have met with several specimens, averaging from four to six inches in height. There is a great resemblance between *Thoa Beanii* and the preceding, with the variety of which it may be readily confounded, particularly when deprived of its very characteristic vesicles. It may, however, be known from it by the branches passing from the main stems nearly at right angles, but at unequal intervals, and by its being *irregularly ringed*, having also a joint between each cell, in which respect it agrees with *T. halicina*.

Sertularia.

Sertularia polyzonias. Between this and the one following there is a manifest relation. They are both usually found upon *Flustra foliacea*, though not confined to it.

Killincy bay; not common.

S. rugosa.—Kingstown; not common.

S. rosacea. Usually found as a parasite on *S. cupressina* and *S. Tamarisca*, particularly on the former.

Dublin bay; abundant.

* I have followed the Arrangement and Nomenclature given in Dr. J.'s admirable work on British Zoophytes.

S. pumila. On *Fucus serratus*, which it thickly covers, near low water mark.

Booterstown.—Dublin bay; not rare.

S. Tamarisca. An inhabitant of deep water, on shells; rather rare. Blackrock, Dublin bay.

S. abietina. Frequently covered with small and elegant tufts of *C. eburnea*, which give to the polypidom a very beautiful appearance; it is sometimes found a foot in height, and of a bright pink colour, which it retains on drying. All the *Sertularieæ* are occasionally found coloured in this way.

Dublin bay; very abundant.

S. Filicula.—Dublin bay; rare.

S. operculata. Of this common species a very delicate variety is occasionally met with, attaining a much greater height than the ordinary kind, and having the shoots waved or zigzag.

Dublin and Killiney bays, on shells and fuci.

S. argentea. Independently of the differences to be observed in the form of the cells and vesicles, which are generally pretty constant, between this and the following species, there are many others pertaining to their general habit and appearances. The polypidoms of this species are frequently met with growing in closely aggregated clusters, and are sometimes even branched, a condition in which I have never found the other; it is also of a darker colour and more rigid texture, and never attains the same height. The polypiers also do not end in the beautiful spire so remarkable in *S. cupressina*, but terminate much more abruptly. The branches too are usually shorter, broader, and *not arched* as in the other species.

Dublin bay; abundant.

S. cupressina. This species sometimes attains an elevation of more than two feet. The polypidom is occasionally denuded of its branches for a short distance up the stem, but this is by no means a constant occurrence, as in some others.

Dublin bay; abundant.

ANTENNULARIA.

Antennularia antennina. The stems of this coralline sometimes exceed a foot in height, and are frequently clustered together to the number of thirty or forty. The number of branchlets in each whorl varies from five to nine, and in the same specimen the number usually remains the same throughout. I have a specimen in my possession from Brighton arising by a *single trunk*, which afterwards breaks up into eight or ten branches, these again subdividing; it well deserves, from its appearance, the appellation of *ramosa*. There is also in it an *absence* of the small tubular cells placed between the larger ones met with in *A. antennina*. See Plate V. From an examination of this specimen I am inclined to think that it is what Lamarck has described under the name of *Antennularia ramosa*, and that it is really and specifically distinct from the other species. I am far, however, from considering every branched specimen of *Antennularia* as the true *A. ramosa*.

Dublin bay; common.

PLUMULARIA.

Plumularia falcata. This common species is sometimes found branched, and attains a foot in height. The vesicles appear in spring. On stones and shells in deep water. Dublin bay; abundant.

P. cristata. On *Fucus siliquosus*; rather common. Dublin and Killiney bays.

P. pinnata.—Dublin bay; not common.

LAOMEDEA.

Laomedea dichotoma. Polypidom usually from eight to ten inches in height, but often more.

Blackrock; rather common.

L. geniculata. Parasitic on sea-weeds, particularly on *Laminaria digitata* and *F. siliquosus.* Dublin and Killiney bays; common.

L. gelatinosa.—Blackrock; not common. The stem of this species is ringed above and below the origin of each footstalk.

CAMPANULARIA.

Campanularia volubilis. This elegant microscopic species is furnished with a delicate joint or hinge, situated at the base of each little cup. This beautiful contrivance is designed, I imagine, to enable this frail zoophyte the better to elude the rude contact of the element by which it is surrounded, by permitting it to bend to a force which it cannot resist.

Dublin bay; not common.

C. Syringa. Parasitic, as in also the preceding, on other corallines, particularly on *S. abietina.* It is worthy of remark, that the more delicate species of zoophytes affix themselves either to sea-weeds or to others of a more robust nature. By so doing they receive the shock communicated by the motion of the surrounding water, as it were, second-hand—the force being first felt by, and partly expended on, the objects to which they are attached before reaching them. By this means also, a much wider range of motion is afforded them for the capture of their prey, than they could possibly enjoy were they rooted by their short pedicles to some fixed and unyielding support.

C. verticillata.—Blackrock; not very frequent.

C.? dumosa. This is now ascertained to be the *Cornularia rugosa* of Cavolini, a figure of which is given in Dr. Johnston's 'British Zoophytes.' Vignette 27. p. 187.

Blackrock, on *P. falcata,* for which it manifests a decided preference; not common.

Order II. Z. ASTEROIDA.

ALCYONIDÆ.

ALCYONIUM.

Alcyonium digitatum.—On old shells, very common; Dublin and Killiney bays.

Order IV. Z. ASCIDIOIDA.

Vesiculariadæ.

An undescribed zoophyte, belonging to this family, is occasionally found in Dublin bay, investing *Fucus serratus*. Dr. Johnston considers it to be new both in species and genus. As specimens of it are in Dr. Johnston's possession, I refrain from giving any detailed description; I may, however, remark, that the animal, which I succeeded in detecting in a specimen preserved in spirits, is apparently similar to that of *Flustra*, being doubled up in the cell in the same manner, and having the head encircled with about twenty tentacula.

Vesicularia.

Vesicularia spinosa.—Dublin bay; common.

Serialaria.

Serialaria lendigera.—Dublin and Killiney bays; not common.

Valkeria.

Valkeria uva.—On *Fucus siliquosus*, rare; Blackrock.

Crisia.

Crisia cornuta.—On sponges, and various corallines; common in Dublin and Killiney bays.

C. chelata.—Blackrock; rare.

C. eburnea. Parasitic on sea-weeds and zoophytes, particularly on *S. abietina*.

Killiney and Dublin bays; common.

C. luxata.—Killiney and Dublin bays; frequent.

C. aculeata. Cells disposed in a double series, armed with a long spinous process; joints of an amber colour.—A. H.

Polypidom erect, bushy, about an inch in height, and beautifully posted; branches alternate; jointed at irregular intervals; internodes narrow at their commencement; cells subalternate, tubular, the majority being furnished with a long spine, which arises from the outer side. Vesicles much resembling a fig in shape, and dotted. See Plate VII. fig. 3, 4.

Brighton; not unfrequent.

Notamia.

Notamia loriculata. The polypidom of this species sometimes attains a height of eight or nine inches.

Dublin and Killiney bays; common.

Hippothoa.

Hippothoa catenularia.—Dublin bay; rare.

Tubuliporidæ.

Tubulipora.

Tubulipora patina. The *Discopora verrucaria* of Fleming.

On shells and corallines, particularly on *N. loriculata*.

T. verrucaria. The *Tupulipora verrucaria* of Milne-Edwards has not been described as British; it is however of common occurrence in Dublin bay, adhering usually to *S. abietina*. It differs from *T. patina* in the cells not being placed in a cup, and from *T. serpens* in their not being arranged in transverse rows. The tubes are sometimes separate and sometimes united. In this latter state it bears a great resemblance to *Discopora hispida*, but may be known from it by the apertures of the tubes being plain. See Plate VI. fig. 3, 4. Is it not the small purple *Eschara* of Ellis?

T. serpens.—Not unfrequent; Dublin and Killiney bays.

Discopora.

Discopora hispida.—From shells and corallines from deep water; not common; Dublin bay.

Celleporidæ.

Cellepora.

Cellepora pumicosa.—Dublin and Killiney bays; very common.

Lepralia. Johnston.

Berenicea hyalina.—Dublin bay; rare; on shells.

Lepralia variolosa.—Dublin bay; rare.

L. ciliata. Cells ovato-globose; aperture circular with a small excavation in its lower margin; spines from 5 to 7, not immediately surrounding the orifice of the cell, differing in this respect from *L. immersa*, in which the spines arise directly from the margin. By means of the indentation referred to, this species may always be distinguished from others, even in the absence of the spines.

On shells and fuci; not uncommon; Dublin and Killiney bays.

"*Lepralia 4-dentata*, Johnston's Manuscript." Cells immersed, arranged alternately; apertures quadrangular, and furnished with four short teeth, placed near each angle.—A. H.

This species was sent to Dr. Johnston some time ago by Mr. Forbes, and subsequently by myself as a new species. See Plate VI. fig. 5.

Membranipora.

Membranipora pilosa.—On shells, fuci, and corallines; very common; Dublin and Killiney bays.

Var. dentata. Not common.

Escharidæ.

Flustra.

Flustra foliacea. The varieties of this species are very numerous. Dublin and Killiney bays; very common.

F. chartacea. This is the *F. papyracea* of Ellis, which for a long time has been lost sight of. His description, however, is inaccurate, inasmuch as he makes no mention of the spines, one of which is placed at each distal angle of every cell. It is one of the most beautiful of the *Flustræ*, growing in bushy hemispherical tufts of

about an inch and a half in height; each tuft is composed of numerous separate polypidoms, closely interwoven with each other, and dichotomously branched. The cells are of an oblong square form, slightly enlarged distally, and furnished with a globular operculum somewhat similar to that of *F. avicularis*.

F. avicularis. This species has four spines at the top of each cell. Parasitic on other corallines; rare; Dublin bay.

F. membranacea. On the frond of *Laminaria digitata*; very abundant; common.

F. Hibernica. Polypidom encrusting calcareous, white; cells hexagonal, excavated, dotted on the inside.—A. H.

The only specimens I have obtained of this are parasitic on an *Ascidia*; I have little doubt, however, of its being a new species. The *Flustra* to which it bears the closest resemblance is perhaps *F. carbasea*, but I have never met with it on this part of the Irish coast. See Plate VII. fig. 1.

Cellularia.

Cellularia ciliata.—Dublin bay; rare.

C. scruposa. On the roots of most corallines and old shells; abundant; Dublin and Killiney bays.

C. reptans. Everywhere very common.

C. Avicularia. This species is, I think, misplaced; it ought rather to be associated with *Flustra* than *Cellularia*.

Dublin bay; rare.

Acamarchis.

Acamarchis plumosa.—Dublin bay; rare.

Farcimia.

Farcimia salicornia. "Articulations cylindrical; cells rhomboidal, plain."

Farcimia sinuosa. Cells rounded above, excavated below for the reception of the head of the succeeding cell; aperture semicircular, situated in the upper third of each cell.—A. H.

I have but little hesitation in pronouncing this to be a new species*. It differs from the ordinary species in the greater size of the cylinders, in the shape of the cells (too material to be the result of any accidental circumstances), and above all, in the position of the aperture, which in this is placed in the upper part of each cell, while in *F. salicornia* it is exactly *central*. This last I consider to be the most important distinction of all. The number of the cells on each cylinder is also much greater than in the preceding species. See Plate VI. fig. 1. 2.

* Among several specimens of *salicornia*, collected by Mrs. Alder and Miss Amelia Hunter, at Blackrock, Dublin bay, I observed some of *Farcimia sinuosa*, agreeing in every particular with my own previously obtained at Menion, about two miles from the former place. The authority for this new species does not now, therefore, rest upon the examination of a single specimen.

Dr. Johnston, to whom I wrote respecting this zoophyte, refers me to a figure in which the cells are shaped as in mine, given in Ellis's work (Plate xxiii. fig. D.), and suggests the possibility of Ellis having found the two forms of cells, viz. the rhomboidal and the rounded, upon one and the same species. This communication led me to make a careful examination of numerous specimens of *F. salicornia*, the results of which has been such as I had anticipated. In no one instance have I ever detected the two forms of cells upon one and the same portion, but have always found the differences which I have pointed out to be constant between specimens. Ellis's figure proves that he had seen my species; but it is also evident that he overlooked the material points of difference between it and the ordinary kind, an unusual error for him to commit, I acknowledge; but nevertheless possible. The circumstance of his having given two separate figures of *Farcimia* is in favour of my opinion of their distinctness as species.

There is one general and undeviating principle presiding over the form and arrangement of the cells of all cellular zoophytes, and operating with such mathematical precision as to give to each species a certain type or character by which it may be distinguished from all others, each having cells of but one shape, and arranged in a uniform and determined order. To imagine, therefore, the existence of two forms of cells so distinct in their character, upon one and the same species, and constituting a part of it, is to suppose an anomaly, of which I believe the whole range of zoophytical productions does not furnish a single example. The differences between the two species are not such as can be explained by a reference to any adventitious causes, such as exposure, the mode of drying, &c.; they are not those arising from mere magnitude; in a word, they are structural.

Alcyonidulæ.

Alcyonidium.

Alcyonidium hirsutum.—Dublin bay; not common.

A. echinatum.—Dublin and Killiney bays; common.

A. parasiticum.—Dublin and Killiney bays; frequent.

Melobesia.

Melobesia elegans. This beautiful microscopic object, which received its name from Mr. Bean, is not more than the sixteenth of an inch in diameter. It is composed of numerous plates of irregular form and dimensions; these plates are inserted into a raised margin or framework, and each is perforated with minute tubular apertures. Whether it is furnished with polypi or not, I believe, is not determined. See Plate VII. fig. 2.

On Fuci; Dublin bay.

Halichondria*.

Halichondria papillaris, Fleming. *Spongia ureus*, Solander. Common, encrusting fuci; Dublin and Killiney bays.

H. palmata.—Dublin bay; not common.

* For an account of this genus, see Fleming's 'British Animals.'

GRANTIA*.

Grantia compressa! *G. foliacea* of Montagu.

Adhering to the under side of rocks above low-water mark; Monkstown.

G. Coronata.—Monkstown: same as the preceding.

MILLEPORA.

Millepora polymorpha, Linn.

Millepora informis, Lamarck. Dublin bay; not common.

Millepora lichenoides. "This *Millepora* has slender semicircular plates which constantly grow horizontally." Lamouroux makes this a *Melobesia* under the name *Melobesia pustulosa*. It ought, I think, to be considered a *Madrephyllia*, under which head Dr. Johnston has placed it. *M. byssoides*, Lamarck.

CORALLINA.

Corallina officinalis. There are several well-marked varieties of this *Corallina cylindrica.*

"Corallina rubens sive museus marinus."—Park.

"This coralline, when magnified, appears to grow in branches, always dividing into two parts, consisting of long cylindrical joints connected by small tubuli."—Ellis.

C. rubens, var. *spenophecos.*

The above four corallines are found attached to rocks at Bray Head, near Dublin.

It is only by an extensive examination of catalogues similar to the foregoing, that we shall be able to arrive at any certain conclusions regarding the geographical distribution of zoophytes, and the changes in the growth and habits occasioned by the different localities in which they are met with. On reference to the preceding list, it will appear that many species common in the North of England and Scotland are either not to be found at all on this coast, or are so sparingly; and on the other hand, many that are rare on the English coast are abundant on the Irish. Thus, *Thuiaria thuja*, common in the North of England, has never, I believe, been noticed on any part of the coast of Ireland, and certainly not on that embraced in the present catalogue.

Again, I have never met with *F. truncata* and *F. carbasea*, both very common on the coasts of Northumberland and Durham, and also occasionally found upon some parts of the Irish coast. Many species of *Plumularia*, and two or three of *Sertularia*, are wanting in these bays; and the genus *Eschara* appears to be absent not only from this part but from the coast of Ireland generally; while *Thoa Beanii*, *Discopora hispida*,

* See Grant in 2nd vol. of Edin. New Phil. Journ.

and *Alcyonidium parasiticum*, all more or less rare on the English coast, are tolerably abundant in these situations. I might enlarge upon this subject, but the data are at present too few to admit of our doing so with certainty.

Many species appear to attain a much greater height in Ireland than in England, as will be evident on a comparison of the sizes given in Dr. Johnston's elegant work and in this Catalogue: this is probably attributable to the mildness of the climate.

EXPLANATION OF THE PLATES.

PLATE V. *Fig.* 1. *Antennularia ramosa.*
Fig. 2. A portion of the same magnified.
Fig. 3. A portion of *A. antennina* magnified, showing the small tubular cells placed between the larger ones, and which are absent in *A. ramosa.*

PLATE VI. *Fig.* 1. A specimen of *Farcamia sinuosa*, of the natural size.
Fig. 2. A portion of the same magnified.
Fig. 3. and 4. Specimens of *Tubulipora verrucaria*: in the one the tubes are separate, in the other united.
Fig. 5. *Lepralia 4-dentata*

PLATE VII. *Fig.* 1. *Flustra Hibernica.* This is a very imperfect representation of the original, the exact appearance of which it is very difficult to represent in a drawing.
Fig. 2. *Melobesia elegans* of Mr. Bean, magnified.
Fig. 3. and 4. *Crisia aculeata*, a new species.

XXII.—*A Synopsis of the Genera and Species of the Class* Hypostoma (Asterias, *Linnæus*). By JOHN EDWARD GRAY, Esq., F.R.S., Keeper of the Zoological Collection in the British Museum.

My intention in sending this paper to the press is not only to bring before the public a number of new genera and species which have been for several years in the collection of the British Museum, but also to attempt to divide what has hitherto been considered an intricate Class into natural groups, to subdivide these groups and the genera they contain into smaller sections, so as to facilitate the determination of the species, and at the same time to assist in making out the natural affinities of this much-neglected group of animals.

Hitherto very few persons have attempted to divide the Starfishes (*Asterias*, Linn.) into natural groups, and it is but recently that Nardo, and subsequently M. Agassiz, have paid any attention to the good groups pointed out by the first author of anything like a Monograph of these animals, I mean of Henry Linck, who published a separate work on the subject in folio, which he dedicated to Sir Hans Sloane and the members of the Royal Society. Nardo has done little more, as I shall presently show, than rename Linck's divisions; and M. Agassiz has followed in Nardo's footsteps, adding one or

two fossil genera which did not come within Linck's or Nardo's object. Mr. Edward Forbes has lately published a description of some Manx species, in which he has divided the *Stellonia* of Nardo into two genera, and added a genus which he calls *Luidia* for a species not known to Linck: he has also used the number of series of suckers (a character noticed by Müller and others) as a generic one.

Linck divides the Starfishes (*Asterias*, Linn.) into two great groups by the presence or absence of the ambulacra on the lower side of the arms, calling the first, which exactly agrees with the *Asterias* of Lamarck, the *Asteriadæ* of this paper, "*stellis fissis*," and the second "*stellis integris*." The latter group he divides into three classes: viz.

1. Stellis vermiformibus = the *Ophiura* of Lamarck.
2. Stellis crinitis? = the *Comatula* of the same author.
3. *Astrophyton*, which is the *Euryale* of the same. Thus we see, that he distinguished all the natural groups, which were afterwards thrown together into a single genus to be artificially divided into sections by Linnæus and his followers. Linck's groups were not again recognized until nearly half a century after the publication of his valuable work.

In dividing the fissured Starfishes, or *Asteriadæ* as we call them in modern nomenclature, into genera, Linck began badly by paying too much attention to the number of the rays, though it is evident, by the names he has given to the different species in his genera, that he was aware that some which he separated on this account were very nearly allied to each other. Overlooking the genera which are formed solely on this character, such as *Trisactis*, *Tetractis*, *Hexactis* and *Heptactis*, which are all formed on varieties or distortions of other species, we shall find that the others noticed by him are excellent genera, and such as are now acknowledged. His

1. Pentanogaster = Goniaster (*) *Agassiz*. Scutasteries, *Blainv.*
2. Pentaceros = Goniaster (**) *Agassiz*. Asterina, *Nardo*. Platasteries, *Blainv.*
3. Astropecten = Stellaria, *Nardo*. Asterias, *Agassiz*.
4. Palmipes = Anseropoda, *Nardo*. Palmasteries, *Blainv.*
5. Stella coriacea = Stellonia, *Forbes*. Stellonia, part, *Nardo*. Pentasteries and Solasteries, *Blainv.*
6. Pentadactylosaster = Cribella, *Agassiz* not *Edwards*. Linckia, *Nardo* not *Agassiz*.
7. Octactis,
8. Enneactis,
9. Decactis,
10. Dodecactis,
11. Triskaidecactis,

} = Solaster, *Forbes*. Stellonia, part, *Nardo* and *Agassiz*.

Nardo, in the Naturforscher for 1833, and in the Isis for 1834, p. 716, gives the following arrangement of the European species, which he divides into five genera:—

1. Stellaria = Astropecten, *Linck*.
2. Stellonia = Stella coriacea, *Linck*, and his other genera above enumerated.

3. Asterina: Linck only knew one species which he put at the end of his *Pentaceros*.
4. Anseropoda = Palmipes, *Linck*.
5. Linckia = Pentadactylosaster, *Linck*.

M. Agassiz, in the Memoirs of the Neufchatel Society, published a new arrangement of the *Echinodermata*, which has been abridged into the Annales des Sciences Naturelles, and from thence translated into the Annals of Natural History, i. 440, in which he has changed the names of some of Nardo's genera, and added some others for extra-European and fossil species, as follows:—

1. Asterias = Astropecten, *Linck*.=Stellaria, *Nardo*.
2. Cœlaster, fossil.
3. Goniaster = Pentagonaster and Pentaceros, *Linck*.
4. Ophidiaster, a new species.
5. Linckia = Cribella = Pentadactylosaster, *Linck*.
6. Stelloma, *Nardo* = Stella coriacea, *Linck*, &c., as above.
7. Asterina, *Nardo*.
8. Palmipes, *Linck*. = Anseropoda, *Nardo*.
9. Culcita, *Agassiz*, for Ast. discoidea, *Lam*.

M. Agassiz generally quotes for the type of his European genera the same species as those cited by Nardo.

Class HYPOSTOMA, *Gray, Syn. Brit. Mus.*

Having a bag-like stomach, with a single opening serving as mouth and vent. The ovarial pores are placed round the mouth. The body is inclosed in a hard skin and supported by variously shaped calcareous pieces.

It should be remarked, that the hard parts of these animals, whether they are in the form of *tesseræ*, as in the *Echinida*, or of *ossicula*, as in the *Hypostomata*, or in that of spines, as in either, are evidently the hardening of certain parts of the cellular substance or skin, and these hard parts retain their organization and vitality during the life of the animal; consequently they are not inorganic secretions, like the shells of mollusca, as they have generally been considered, but have far more relation to bones and coral, and like them form a peculiar kind of body intermediate between shells and the skeletons of vertebrata. "These pieces," as I have observed in the Synopsis of the British Museum, "are formed by the earthy particles being deposited round certain definite spots in the skin, and as they are developed they assume a definite arrangement into certain distinct shapes peculiar to the different kinds: although these are strongly united together by the skin, and have a kind of organization during the life of the animal, they may easily be separated from each other after death, and then appear like separate bones. This structure allows the animal to increase both the size and the number of the pieces that compose its protecting case as the body grows, and also to repair, by the deposition of fresh calcareous particles on the skin of the healed part, any injury which the animal may have received from external accidents during its life."

This structure is not so easily demonstrated in the internal bones

of the Starfishes as it is in the external tesseræ of the Sea Eggs, and in the spines of both these kinds of animals, as they are often to be found broken and repaired during their growth, and this repair does not take place by any secretion applied to their surface, but by a healing of the part, which leaves a scar on the surface. Nevertheless, the entire similarity which exists between the external spines and the internal tubercles at once shows that they are of the same structure; and this is further proved by the examination of the tubercles of those kinds which are in great part exposed on the surface, as is the case with the different kinds of *Pentaceros*, where the development of these hard parts can often be observed during the process of reproducing an arm that has been accidentally injured or destroyed.

The specimens described in this synopsis are either in the collection of the British Museum or in that of the Zoological Society, which includes the specimens discovered by Mr. Cuming during his residence in South America, and presented by him to the Society.

Order 1. Asteroida.

Body free, star-shaped, with distinct small ambulacra (or walks) of double pores on the oral surface, from the mouth to the ends of the rays; dorsal wart distinct.

These animals have the faculty of reproducing the arms or such parts as may be accidentally broken off; and if an entire arm be separated, provided part of the body be attached to it, other arms are reproduced, and a fresh perfect animal formed.

Sect. 1. *The Ambulacra with four rows of feet; dorsal wart simple.*

Family 1. Asteriadæ, *Gray, Syn. Brit. Mus.* 62.

1. Asterias.

Skeleton netted with a single mobile spine at each anastomosis of the ossicula; body covered with more or less prominent elongated mobile spines*.

a. *Rays* 12 *or* 13, *slender, tapering, with small elongated spines.*

1. *Asterias Aster*, Gray. Rays 3 times as long as the diameter of the body; back with 7 series of spines, the labial spine at the angles of the arms very long.

Inhab. ——. Brit. Mus.

* Some continental zoologists have objected to the shortness of my generic and specific characters; and I therefore think it right to observe, that it does not seem to me either necessary or desirable to give more than the essential distinguishing marks, in a monograph founded on the complete analysis of a large collection of species. On the other hand, it appears to me to be quite right, in the publication of a single supposed new genus or species, or of a limited number of them, where the author either wants the materials or the time for a rigid examination of the entire group, to give all the assistance that can be derived from a detailed description. No naturalist will doubt which is the easier process; and few, I think, will hesitate as to which is the most advantageous to science.

b. *Rays 6 or 8 cylindrical.*

2. *Asterias calamaria*, Gray. Arms four times as long as the diameter of the body, with 7 ridges of spines; the 5 dorsal ridges equidistant.

Inhab. Isle of France, New Holland. Brit. Mus.

c. *Rays 5—8, elongated, subcylindrical, with 5 or 7 series of spines, the 2 lower series close together and near the ambulacra.*

3. *Asterias glacialis*, Linck, t. 38, 39. *A. spinosa*, Pennant. Rays 4 or 5 times as long as the diameter of the body; spines acute. Var. 1. 8-rayed; var. 2. shorter rayed; Madeira.

Inhab. English coast, Mediterranean.

4. *Asterias rustica*, Gray. Rays 6, flat, broad; spines short, thick, truncated.

Inhab. Valparaiso, in sandy mud, *H. Cuming, Esq.* This species has a series of small triangular plates, pierced with a central triangular hole, within the marginal ambulacral spines.

5. *Asterias echinata*, Gray. Rays 8, twice as long as the width of the body, five-sided; central ridge of spines interrupted.

Valparaiso, on mud, about 4 to 6 fathoms. *H. Cuming, Esq.*

d. *Rays 5, tapering; the ambulacral series of spines crowded, as if 2 or 3-rowed; back netted with a ridge of two or three rows of spines next the ambulacral series, and then a single series of spines.*

6. *Asterias Holsatica*, Retz. Ast. 22. & 26. *Asterias violacea*, Müller, Z. D. ii. t. 46. *A. glacialis*, John. Rays tapering, nearly 3 times as long as the width of the body.

Inhab. Northern Europe. Colour very variable.

7. *Asterias rubens*, Linn. Rays broad, more than twice as long as the width of the body, with scattered blunt spines, spinulose at the tip.

Inhab. European ocean. Is not this only the female with eggs of the former?

8. *Asterias Katherinæ*, Gray. Rays 6 or rarely 5, nearly 3 times as long as the width of the body; back with scattered and crowded blunt rough-tipped spines.

Inhab. North America, mouth of the Columbia river. *Lady Katherine Douglas.*

9 *Asterias Wilkinsonii*, Gray. Rays 5, nearly three times as long as the width of the body; back with about 7 irregular interrupted series of rather blunt rough spines.

Inhab. Northern Africa. *Sir J. G. Wilkinson.*

See also *Ast. tenuispinosa*, Lam.; *Ast. hispida*, Penn.; *Ast. Savaresi*, Chiaje. t. 18. f. 6; and *Ast. spongiosa*, Fab.

e. *Body discoidal, divided at the edge into numerous short tapering rays; the series of spines near the ambulacral series rather crowded, large and elongated.* Heliaster, Gray.

10. *Asterias Helianthus*, Lam. 20. E. Meth. t. 108. 109. Arms

33 or 34, about $\frac{1}{4}$ the length of the width of the body, with three equidistant series of short blunt spines.

Inhab. Guasco, Chili, *Say*. Valparaiso, *H. Cuming, Esq.*

11. *Asterias Cumingii*, Gray. Arms 30 or 31, very short, not $\frac{1}{10}$ as long as the diameter of the body, conical, with blunt spines.

Inhab. Hood's Island, on rocks at spring tide. *H. Cuming, Esq.*

12. *Asterias multiradiata*, Gray. Arms 22 or 24, cylindrical, elongated, tapering at the ends, $\frac{1}{3}$ longer than the diameter of the body; the dorsal series of spines rather longer and more compressed.

Inhab. Hood's Island. *H. Cuming, Esq.*

2. Tonia, *Gray*.

Skeleton netted with a series of crowded small blunt mobile spines on the sides of each ossiculum; ambulacra bordered with a crowded series of subulate spines, and without any triangular pierced pieces within them.

1. *Tonia atlantica*, Gray. Rays 5, more than twice as long as the width of the body; back with 9 series of cross bands.

Inhab. Valparaiso, on rocks at low water. *H. Cuming, Esq.*

Sect. 2. *The ambulacra with only two rows of feet.*

Fam. 2. Astropectinidæ.

Back flattish, netted with numerous tubercles, crowned with radiating spines at the tip, called Paxilli.

A. *The margin of the rays ciliated with a series of simple elongated spines, the paxilli or crowned tubercles regularly radiating.*

a. *The rays edged with a series of large regular tubercles, which increase in number as the animal grows.*

1. Nauricia, Gray.

The ambulacral spines broad and ciliated; 2 series of tesseræ between the angles of the arms and the mouth beneath. Asiatic.

1. *Nauricia pulchella*, Gray. Seba, iii. t. 8. f. 7. a. b. not good. Rays 5, half as long as the width of the body, gradually tapering, lower series of marginal tubercles with a series of broad flat spines on the upper margin of each.

Inhab. China? Japan?

2. Astropecten, Linck. Fringed Star Fish.

Ambulacral spines simple, linear, without any tesseræ between the marginal tubercles near the mouth and angles of the arms.

1. *Body pentagonal; rays short.*

1. *Astropecten corniculatus*, Linck. t. 27. & t. 36. f. 63.

Inhab. ————. Perhaps a variety of the next.

2. *Astropecten polaris* = Asterias polaris. *Sabine, Append. Parry's Voy.* 223. t. 1. f. 2, 3.

Inhab. North Sea.

2. *Body 5-rayed, arms depressed; the upper series of marginal tubercles broad, rounded or shelving towards the edge.*

a. *The dorsal tubercles between the angles of the arms on the centre of the back and on the lines down the centre of the arms the largest.*

3. *Astropecten stellaris.*

Inhab. ———.

\- - - *dorsal tubercles subequal, with fasciculated spines.*

† *The oral series of marginal tubercles produced beyond the dorsal ones.*

* *The upper marginal tubercles with a single series of spines at the angle of the base of the rays, and with another series at the end of the rays, which together make a double series near the base of the rays.*

4. *Astropecten duplicatus*, Gray. Rays three times as long as the diameter of the body, slender; marginal spines elongated, depressed, linear.

Inhab. St. Vincent's. *Rev. L. Guilding.*

5. *Astropecten aurantiacus.* Asterias aurantiaca, *Linn.* Rays three times as long as the diameter of the body, slender; marginal spines subulate, elongated.

Inhab. Mediterranean.

6. *Astropecten stellatus*, Gray. Rays more than twice as long as the width of the body. The central area of the arms is about as wide as one series of the marginal tubercles.

Inhab. Coast of South America?

** *The upper series of marginal tubercles with a continued single series of spines on the angle of the arms.*

7. *Astropecten armatus*, Gray. Rays elongate, regularly tapering; upper marginal tubercles narrow, with a continued series of erect, elongated, subulate spines. Var. 2. *Patcher*, the under series of marginal tubercles not produced, and the spines more slender.

Inhab. Puerto Portrero, South America, on sandy bottoms, 9 fathoms. *H. Cuming, Esq.* Var. 2.

8. *Astropecten echinatus*, Linck, 29. t. 8. f. 12. 12. Rays rather more than twice as long as the width of the body; upper series of spines large, lower series depressed, acute.

See also *Astropecten bispinosa* = *Asterias bispinosa*, Otto.

*** *The upper series of marginal tubercles spineless, the lower series much produced.*

9. *Astropecten marginatus*, Gray. Rays nearly three times as long as the width of the body; lower marginal tubercles linear, depressed.

Astropecten fimbriatus, Linck, is probably this species with the marginal spines lost.

10. *Astropecten regalis*, Gray. Rays one-fourth longer than the diameter of the body, broad, tapering; spines broad, blunt, depressed.

Inhab. St. Blas. *H. Cuming, Esq.*

Like *A. marginatus*, but the arms are shorter and broader.

**** *The upper series of marginal tubercles with 2 series of spines at the base and 1 along the edge of the arms.*

11. *Astropecten crinaceus*, Gray. Arms gradually tapering, twice as long as the width of the body; upper marginal tubercles rather narrow, with a series of small short spines, and a series of 6 or 8 larger ones.

" St. Elena, sandy mud, 6 fathoms." *H. Cuming, Esq.*

†† *The under or oral series of marginal tubercles rounded and not produced beyond the dorsal ones.*

* *The upper series with a series of short spines.*

12. *Astropecten Mauritianus*, Gray. Rays broad; lower spines broad, strap-shaped.

Inhab. Isle of France.

** *Upper series spineless.*

13. *Astropecten mesodiscus*, Linck, 29. t. 4. f. 16. Rays elongate, slender, tapering; upper marginal tubercles narrow, with 2 series of short small tubercles like granules, one on each of the margins; lower spines broad, elongate.

Inhab. ——.

14. *Astropecten gracilis*, Gray. Rays elongate, slender, gradually tapering; upper marginal plates rather broad, granular with fine spines on the suture between them; lower spines small, blunt, depressed.

Inhab. ——. Like the former, but arms narrower.

15. *Astropecten irregularis*, Linck, 27. t. 6. f. 13. A. aurantiaca, *Muller*, Z. D. t. 83. A. Johnstoni, *Chiaje*? Rays rather broad, tapering; the upper tubercles rather broad, with a series of 1 or 2 scattered tubercular spines near the tip; lower spines depressed, acute.

Inhab. Pembrokeshire, *Linck*.

16. *Astropecten dubius*. Rays broad, tapering; upper marginal tubercles rather broad, granular, spineless? lower spines broad, depressed.

Inhab. West Indies.

*** *Upper and lower margin spineless, serrated?*

17. *Astropecten regularis*, Linck, 26. t. 8. f. 11. Asterias petalodea, *Retz*, *Aster*. 16. n. 14?

Inhab. ——. I have never seen this species.

3. *Body 5-rayed, the arms high, narrow; upper marginal tubercles very narrow and erect; the line of dorsal tubercles down the centre of the arms the largest.* *Astropus*, Gray.

18. *Astropecten longipes*, Gray. Rays long and narrow; the upper marginal tubercles minutely granular, and 1 or 2 of them often furnished with a short broad conical spine; lower with a broad depressed blunt erect adpressed spine; monstrosity 4-rayed.

Inhab. "Isle of France," *Leach*.

See also *Ast. pentacantha*, *Ast. spinulosa*, *Ast. platycantha*, *Ast. subinermis*, Philippi, (but this author considers the number of the marginal tubercles, which increase with the age of the specimen, as a specific character,) and *Asterias calcitrapa*, Lam.

b. *The rays without any large tubercles on the margin.*

3. Luidia, Forbes.

Margin of the 5 flat rays erect; the dorsal surface crowded with regular paxilli.

1. *Luidia fragilissima*, Forbes in Wern. Trans. 1839, 14.—Asterias rubens, *Johnston in Mag. N. H.* 144. f. 20.
Inhab. North Sea.

2. *Luidia Savignii*, Gray. Ast. Savignii, *Audouin in Savigny, Egypt, Echinod.* t. 3.
Inhab. Red Sea.

3. *Luidia? ciliaris*. Asterias ciliaris, *Philippi in Wiegm. Arch.* 1837, 19.
Inhab. Sicily.

4. Petalaster, Gray.

Margin of the rays shelving; the dorsal surface with equal paxilli placed in longitudinal and cross series. Asiatic.

1. *Petalaster Hardwickii*, Gray. Rays elongated, rather slender, tapering at the end; the dorsal tubercles with small truncated spines, and a distinct series of rudimentary spines.
Indian Ocean.

2. *Petalaster Columbia*. Rays elongated, slender, gradually tapering; tubercles short, with crowded groups of rather large acute spines, and a fringe of very fine radiating ones.
Inhab. St. Blas. *H. Cuming, Esq.*

B. *The margin of the rays not edged with large tubercles, simple, or ciliated with short broad spines bearing tubercles.*

5. Solaster, Forbes.

The rays many, with 2 series of broad spines bearing tubercles near the ambulacra.

a. *Body 8 or 9-rayed, closely reticulated, rays rounded, ventricose below, tapering at the tip, with a second row of compressed tubercles on the under side of the arms near the ambulacral series.* Endeca, *Gray*.

1. *Solaster Endeca*, Forbes. Asterias Endeca, *Linn.* Ast. aspersa, *Muller*.
Inhab. European Ocean.

b. *Body 10 or 12-rayed, loosely reticulated; the rays depressed, with a series of large compressed tubercles crowned with a bunch of spines edging the oral ridge.* Polyaster, *Gray*.

2. *Solaster papposa*, Forbes. Asterias papposa, *Linn.* Ast. stellata, *Retz*.
Inhab. European Ocean.

6. Henricia, Gray. Linckia, *Forbes* not *Nardo*.

The rays 5, rounded, tapering, with rounded tubercles near the ambulacra; the dorsal wart obscure, few rayed, often hidden with small spines.

1. *Henricia oculata*, Gray. Asterias oculata, *Penn.* Asterias seposita, *Penn.*? Rays 5, closely reticulated with small spines.

Inhab. European Ocean.

[To be continued.]

XXIII.—*On the true Method of discovering the Natural System in Zoology and Botany.* By Hugh E. Strickland, M.A., F.G.S., &c.*

It is probable that most naturalists at the present day have an instinctive belief in the existence of a natural system in Zoology and Botany, but there are very few who if questioned on the subject could give any clear explanation of the grounds of their belief, of the nature of that system, or of the mode by which a knowledge of it may be attained. The uncertainty which hangs over the subject is doubtless owing to the obscure and metaphysical nature of some of the principles involved, and still more to the vague conceptions and crude theories which have been promulgated on the subject.

This essay is contributed in the hope that, even if its own arguments are of little value, it may, at least, induce others to investigate the subject on more correct principles than have hitherto been followed.

The postulate with which I commence the inquiry is, to let it be granted that there are such things as *species*, distinct in their characters and permanent in their duration. This being admitted, we define the natural system to be *the arrangement of species according to the degree of resemblance in their essential characters.* In other words, the natural system is that arrangement in which the distance from each species to every other is in exact proportion to the degree in which the essential characters of the respective species agree. Hence it follows that the whole difficulty of discovering the natural system consists in forming a right estimate of these degrees of resemblance. For the degree in which one species resembles another must not be estimated merely by the conspicuousness or numerical amount of the points of agreement, but also by the physiological importance of these characters to the existence of the species. On this point no certain rules have yet been laid down; for though naturalists in general admit, for instance, that the

* Read before the Zoological Section at Glasgow, Sept. 21, 1840.

nervous system is superior in importance to the circulatory, and the latter superior to the digestive system, yet this subject is still in a very indeterminate state, and until our knowledge of physiology is much further advanced, disputes will always arise respecting the true position of certain species in the natural classification. Such differences of opinion, however, will continually diminish as our knowledge increases, and they are even now very few in comparison with the numerous facts in classification on which all naturalists are agreed. Much may be effected by education and habit, which impart to the naturalist a peculiar faculty (termed by Linnæus a "latent instinct") for appreciating the relative importance of physiological characters, to the satisfaction of himself and others, even in cases where he is unable to explain the principles which determine his decision.

Granting, then, that by combining the *number* of points in which any two species agree, with an estimate of the *physiological importance* of those several points of agreement, the naturalist may, in practice, form a tolerably exact conception of the *degree of resemblance* between them; he will proceed in his construction of the natural system to place these species at greater or less distance from each other, in proportion to that degree of resemblance. If we suppose that by a repetition of this process every species is placed in its true position, we obtain a definition of those much-disputed terms, *affinity* and *analogy*,—the former of which consists in those *essential* and *important* resemblances which determine the place of a species in the natural system, while the latter term (analogy) expresses those *unessential* and (so to speak) *accidental* resemblances which sometimes occur between distantly allied species without influencing their position in the system. With *analogy*, therefore, we have no further concern in the present discourse, as it is a principle in no way involved in the natural system. *Affinity*, on the contrary, forms the chief element in this inquiry; and to place species in the order of their affinities is to construct the natural system*.

It appears from the above views that the natural system is an accumulation of facts which are to be arrived at only by a slow inductive process, similar to that by which a country is geographically surveyed. If this be true, it is evident how

* I am aware that by many naturalists analogy is considered to be as important an element in the natural system as affinity is. As the discussion of this question would lead us away from the present object, I will not enter upon it now, especially as my views respecting it are stated more at large in the Mag. of Nat. Hist. for May last, p. 222 *et seq.*

erroneous must be all those methods which commence by assuming an *à priori* system, and then attempt to classify all created organisms in conformity with that system. This, nevertheless, is a defect which exists more or less in many modern methods of classification. The greater part of these arrangements are based on an assumption that organic beings have been created on a regular and symmetrical plan, to which all true classifications must conform. Some naturalists have attempted to place all animal species in a straight line, descending from man to a monad. This theory assumes that each species (excepting the two extremes) has two and only two direct affinities; one, namely, with the species which precedes, and the other with that which follows it. Others, perceiving the existence in many cases of more than two direct affinities, have compared the natural system to a series of circles, or to the reticulations of network. Many authors have assigned the most mathematical symmetry to the different parts of the system by maintaining the prevalence throughout of a constant number, such as 2, 3, 4, 5, or 7. In applying these views to facts, they have of course found numerous exceptions to the regularity of their assumed formulæ; but by adducing the extermination of some species, and our ignorance of the existence of others, and by applying a Procrustean process to those groups which were either larger or smaller than the regulation standard, they have removed the most glaring objections to their theory, and have with wonderful ingenuity given their systems an appearance of truth*. But when the unprejudiced naturalist attempts to apply any one of these systems to Nature, he soon perceives their inefficiency in expressing the real *order of affinities*. The fact is, that they all labour under the vital error of assuming that to be symmetrical, which is in an eminent degree irregular and devoid of symmetry. I will now proceed to give my reasons for taking this view of the subject.

1. *A priori* considerations, so far from leading us to assume a *regular geometrical pattern*, or *numerical property* in the

* As these remarks may appear somewhat severe, it is right to substantiate them by a few examples. So long as these systems are admitted by their authors to be *artificial*, it would be as unjust to object to them, as to complain of the alphabetical arrangement of an encyclopædia, that it broke the connection of the subjects. The reply would of course be, that an encyclopædia does not profess to arrange subjects in their natural order, but merely aims at convenience of reference. The remarks in the text, therefore, merely apply to those *symmetrical* methods which profess to exhibit *The Natural System*. The examples are selected from Mr. Swainson's 'Classification of Birds,' in which work the *reality* of the quinary system is insisted on throughout. See Appendix.

groups of organized beings, appear to indicate the direct contrary; for the analogies of external nature all indicate the utmost variety and irregularity. Beautiful as are the examples of creative design exhibited in the universe, and admirable as are the adaptations of one part of nature to another, there is no department of the creation which is tied down to mathematical laws and numerical properties further than is sufficient for the due performance of its destined functions. There are indeed certain mathematical laws which regulate the motions of bodies and their chemical combinations, but these do not give to the face of nature that symmetrical and *artificial* appearance which is aimed at by the zoological systems above-mentioned. For example, the relative distances of the planets, their magnitudes, and the number of their satellites conform to no known numerical law. The fixed stars exhibit no regular arrangement, either in their magnitudes, distances, or positions, but appear scattered at random across the sky. To descend to our own earth, no symmetry is traceable in the forms of islands or continents, the courses of rivers, or the directions of mountain-chains. Organic life exhibits the same irregularity,—no two plants, and no two leaves of the same plant were ever perfectly identical in size, shape, colour, and position. In the "human face divine," portrait-painters affirm that the two sides never correspond; and even when the external form of an animal exhibits an appearance of bilateral or radiate symmetry, nature departs from it in her arrangement of the internal structure. In short, variety is a great and a most beautiful law of Nature; it is that which distinguishes her productions from those of art, and it is that which man often exerts his highest efforts in vain to imitate. When, therefore, we find a system of classification proposed as the natural one which departs from this universal law of variety, and fetters the organic creation down to one unalterable geometrical figure or arithmetical number, there is, I think, a strong *à priori* presumption that such a system is the work not of nature but of art.

2. It follows from the irregularity of external nature, as seen on the surface of the earth, that the groups of organized beings *must* be irregular also, both in their magnitudes and in their affinities. In proof of this it must be granted that the final cause of the creation of every animal and plant is the discharge of a certain definite function in nature, and not the mere occupation of a certain post in the classification: in short, that the design of creation was to form not a cabinet of curiosities, but a living world. Few, I trust, would hesitate to admit this proposition. If, then, the different modifi-

cations of structure which constitute the characters of groups were given solely with reference to the external circumstances in which the creature is destined to live, it follows that the irregularities of the external world must be impressed upon the groups of animals and of plants which inhabit it. The supply of organic beings is exactly proportioned to the demand; and Nature does not, for the sake of producing a regular classification, go out of her way to create beings where they are not wanted, or where they could not subsist. Thus, for instance, the warm climate and varied soil of the tropics admits of the growth of a vast variety of flowers and fruits. The group of Humming-birds which feed on the former, and of Parrots which feed on the latter, are accordingly found to be developed in a vast variety of generic and specific forms; while the family of Gulls which seek their food in the monotonous and thinly inhabited regions of the north, are few in species and still fewer in genera. Again, the variety of plants in the tropics admits the existence of a great variety of insects, and the family of Woodpeckers is proportionately numerous; while the Oxpecker (*Buphaga*), which seems to form a group fully equivalent in value to the Woodpeckers, is limited to but one or two species, because its food is confined to a few species of insects which only infest the backs of oxen.

It follows, then, that the groups of organized beings will be great or small, and the series of affinities will be broken or continuous, solely as the variations of external circumstances admit of their existence, and not according to any rule of classification. If, indeed, we were to imagine a world laid out with the regularity of a Chinese garden, in which a certain number of islands agreeing in size, shape, soil, and form of surface, were placed at exactly equal distances on both sides of the equator, we might then conceive the possibility of a perfect symmetry in the groups of beings which inhabit them; but without some such supposition, I do not see how a class of animals or plants can be symmetrical in themselves, and yet be expressly adapted for conditions of existence which are eminently irregular.

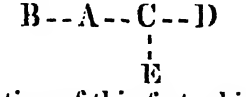
3. To pass from syllogism to induction, it is most certainly not the case that any definite number or geometrical property runs through the animal or vegetable kingdom. I do not wish on the present occasion to enter on any criticism of individual systems, but it would be easy to show that no *symmetrical* system yet proposed is a true picture of the real series of affinities. Without referring to the numerous gaps in these systems which are referred by their authors to species

being extinct or unknown, I could point out numerous examples in which natural affinities are violated, insignificant groups promoted, or important ones reduced to the ranks, in the vain endeavour to drill the irregular troops of Nature into the square, the column, and the phalanx*. And although in some cases we do find examples of the recurrence of a certain number in the subdivisions of natural groups, yet when we remember the ease with which groups may be extended or curtailed to support a theory, the numerous exceptions which occur to these numbers, and the variety of numerical theories which have been maintained with equal firmness by different authors, we cannot, I think, regard these occasional coincidences of number as otherwise than accidental.

If, then, the diversities of organic structure, being adapted to the varying conditions of the earth's surface, are, like them, full of irregularity and variety, it is plain that we can no more speculate theoretically as to what groups are likely to remain undiscovered, than we can predict the discovery of rivers, lakes or islands in any unexplored portion of the earth's surface. Both inquiries must be pursued in the same way, viz. by a careful induction of facts; and it will be found that there is much analogy between the process here recommended and that of a geographical survey. The plan proposed is to take any species, A, and ask the question, What are its nearest affinities? If, after an examination of its points of resemblance to all other known species, it should appear that there are two other species, B and C, which closely approach it in structure, and that A is intermediate between them, the question is answered, and the formula B A C would express a portion of the natural system, the survey of which is so far completed. Then take C, and ask the same question. One of its affinities, that of C to A, is already determined; and we will suppose that D is found to form its nearest affinity on the other side. Then B A C D will represent four species, the relative affinities of which are determined. By a repetition of this process, supposing our knowledge of the structure of each species to be complete, and our rules for determining the degrees of affinity correct, the whole organized creation might be ultimately arranged in the order of its affinities, and our survey of the natural system would then be finally effected. Now, if each species never had more than two affinities, and those in opposite directions, as in the above example, the natural system would form a straight line, as some authors have assumed it to be. But we shall often find, in

* See Appendix.

fact, that a species has only one direct affinity, and in other cases that it has three or more, showing the existence of lateral ramifications instead of a simple line; as shown in this example, where C, besides its affinity to A and D, has an affinity to a third species, E, which therefore forms a lateral ramification.



It was the observation of this fact which led some naturalists to adopt the circular instead of the linear theory, still adhering to the assumption of a symmetrical figure, but changing their notions of its form. Now although we find occasional ramifications in the affinities, and although these ramifications may occasionally anastomose and form a circle, yet it has been shown that the doctrine of a regular figure cannot be sustained, and therefore if even it be permitted to man to discover what the true figure is which will express all the affinities of organic bodies, it can only be effected by constructing it piecemeal in the way above proposed. All that we can say at present is, that ramifications of affinities exist; but whether they are so simple as to admit of being correctly depicted on a plane surface, or whether, as is more probable, they assume the form of an irregular solid, it is premature to decide. They may even be of so complicated a nature that they cannot be correctly expressed by terms of space, but are like those algebraical formulæ which are beyond the powers of the geometrician to depict. Without, however, going deeper into this obscure question, let us hope that the affinities of the natural system will not be of a higher order than can be expressed by a solid figure; in which case they may be shown with tolerable accuracy on a plain surface; just as the surface of the earth, though an irregular spheroid, can be protracted on a map. The natural system may, perhaps, be most truly compared to an irregularly branching tree, or rather to an assemblage of detached trees and shrubs of various sizes and modes of growth*. And as we show the form of a tree by sketching it on paper, or by drawing its individual branches and leaves, so may the natural system be drawn on a map, and its several parts shown in greater detail on a series of maps.

* If this illustration should prove to be a just one, the order of affinities might be shown in museums in a pleasing manner by constructing an artificial tree, whose ramifications should correspond with those of any given family of birds, and by then placing on its branches a stuffed specimen of each genus in their true order.

In order to show that the views here maintained are not chimerical, I will here present one or two *sketch*-maps of different families of birds, though I am well aware that our knowledge of natural history is as yet far too imperfect to pretend to accuracy*. Such sketches as these can be compared only to the rude efforts at map-making made by the ancients, of which the Peutinger Table is an example; and it is probably reserved for a distant age to introduce that degree of exactness into natural history which in modern geography is attained by a trigonometrical survey. For the sake of simplicity, in making these sketches I have omitted the consideration of *species*, but assuming that the genera of modern authors consist solely of closely allied species, I have proceeded to group them in what appeared to be their true position in respect of their affinities. In order to place these groups at their true distances, it is necessary to form a *scale of degrees of affinity*, to which the intervals between each genus shall correspond. I am aware that this scale must be, in some measure, arbitrary; but for this there is no remedy. The division of the fixed stars into *seven* magnitudes is arbitrary also, yet it is found in practice to answer the purpose. It is evident, from the complex ramifications assumed by the natural system, that it is impossible, in a zoological work, to describe each genus or species in the exact order of their affinities, but that leaps must often be made from one part of the system to another, just as in a geographical work we cannot describe the counties of Great Britain in their exact order of position, but must continually make lateral digressions, and then return to the main line of our route. So in anatomy, we not only cannot study or describe the several parts in the order in which they join each other in the human body, but each part must even be dissected out from the rest, and removed from its natural position, before we can comprehend its characters and functions. This is an inconvenience inseparable from the nature of the case, and it is therefore no just complaint to make against a systematic work, that it frequently makes diversions which break the order of affinities. We are therefore at liberty to consult our own convenience, and consequently, whatever may be the form which the natural system, on further survey, may assume, there will be no reason for departing widely from the usual custom of commencing with Mammalia, and proceeding through Birds, Reptiles, and Fish, to the Mollusca, Annulosa, Radiata, &c. Let it not then be objected to the

* See Plate VIII., which exhibits one of these attempts at zoological map-making.

method here proposed, that it is subversive of the arrangements now in use. No *linear* arrangement, whether adopted in a museum, a catalogue, or a descriptive work, ever *can* express the true succession of affinities: such an arrangement, therefore, is necessarily in great measure artificial, and, if sanctioned by custom, may still be adhered to. The true order of affinities can only be exhibited (if at all) by a pictorial representation on a *surface*, and the time may come when our works on natural history may all be illustrated by a series of *maps* on the plan of those rude sketches which are here exhibited.

Those symmetrical systems which are here combated are the natural result of that instinctive love of order which is innate in man, and which produces all the noblest works of art. It would doubtless have been more *convenient* for the arrangement of our museums, and more agreeable to our love of order, if the groups of organized beings *had* resolved themselves into a symmetrical plan; but if such is not the case, we must not sacrifice truth to convenience. My object in communicating these remarks will be gained if they induce naturalists to study Nature simply as she exists,—to follow her through the wild luxuriance of her ramifications, instead of pruning and distorting the tree of organic affinities into the formal symmetry of a clipped yew-tree.

It is needless to observe, that although the above remarks have been applied chiefly to the animal kingdom, yet that the principles here announced, if true at all, may be applied with equal correctness to botanical as to zoological systems.

Appendix.

In Mr. Swainson's 'Classification of Birds,' the Procrustean process is effected in *five* different ways. 1. By transferring the members of redundant groups to fill the blanks in those which are deficient. Examples: *Haliaëtus* is transferred from Aquilinæ, and made a subgenus of *Astur*; *Myophonus* is transferred from Merulinæ to Myotherinæ; *Cinclosoma* from Turdidæ, and made a subgenus of *Grallina*; *Irena* from Dicrurinæ, and made a subgenus of *Oriolus*; Querulinæ from Ampelidæ to Muscicapidæ; Coracinæ from Ampelidæ to Corvidæ; *Carduelis* and *Linaria* are transferred from Fringillinæ to Coccothraustinæ; *Scythrops* from Cuculidæ to Rhamphastidæ; *Tichodroma* from Sittinæ to Troglodytinæ; *Orthonyx* from Crateropodinæ (where it comes next *Psophodes*) to Buphaginæ; *Hæmatopus* from Charadriadæ to Ardeadæ; *Eurypyga* from Ardeadæ to Scolopacidæ; *Phaëton* from Pelecanidæ to Laridæ; and *Dromas* from Charadriadæ to Laridæ.

2. By uniting together groups which are naturally distinct. Examples: *Harpyia* is united with *Morphnus*; *Ibycter* with *Daptrius*; *Corvinella*, Less. (*Lanius flavirostris*, Sw.) with *Lanius*; *Cyclarhis* with *Falcunculus*; *Psophodes*, *Sphenura*, and *Dasyornis* with *Timalia*; *Mecistura* and *Calamophilus* with *Parus*. The Iodinæ are united with Muscicapinæ; *Corydon*, Less. (*Coracias sumatranus*, Raff.) with *Eurylaimus*; *Cissopis* with *Pitylus*; the Furnarinæ with Certhianæ; the Phœnicophainæ with Crotophaginæ; *Dacnis* with *Nectarinia*; the Tamatiadæ with the Halcyonidæ; *Syrrhaptes* with *Pterocles*; the Chionidæ with the Columbidæ; the Cracinæ and Psophinæ with Megapodinæ; *Gallinula* (*G. chloropus*) with *Fulica*; *Mergulus* and *Utamania* with *Mormon*; and *Puffinus* with *Thalassidroma*.

3. By dividing groups which are naturally united. Examples: the Philomelinæ are divided from the Sylvianæ, and the Agelainæ from the Icterinæ.

4. By raising subordinate groups above their natural station. Examples: *Budytes*, a subgenus of *Motacilla*, is made a genus equivalent to *Lessonia*, *Enicurus*, and *Anthus*; *Leptonyx* and *Plectrophanes*, subgenera of *Emberiza*, are made of equal value with the genus *Fringilla*; *Nyctiornis*, a subgenus of *Merops*, is put on a par with *Coracias*; *Lamprotila*, a subgenus of *Galbula*, is made a genus.

5. By degrading important groups below their natural station. Examples: *Circaëtus* is made a subgenus of *Gypogeranus*; *Cossypha* of *Orpheus*; *Pomatorhinus* and *Timalia* of *Malacocercus*; *Securus* of *Accentor*; and *Blechropus* of *Fluvicola*: *Rhamphopis* is made a subgenus of *Tanagra*; *Euphonia* of *Aglaia*; *Crithagra* and *Spermophila* of *Pyrrhula*; *Gymnophrys* of *Manorhina*; *Pterocles* of *Tetrao*; *Apteryx* of *Struthio*; *Alectheltia* of *Gallinula*; *Phalaropus* of *Scolopax*; *Recurvirostra* and *Totanus* of *Himantopus*; *Tachydromus* of *Glareola*; and *Phaëton* and *Rhynchops* of *Sterna*.

Without pretending to assert that in all the above instances my views of the affinities are right and Mr. Swainson's wrong, I will only ask any unbiassed naturalist to examine the objects themselves, without reference to books, and then say whether, in the majority of the above examples, the true order of affinities has not been violated for the sake of supporting a preconceived theory.

It may be added, that after all these efforts, the system of ornithology proposed by Mr. Swainson is very far from being a quinary one. Without referring to the very numerous instances in which his subdivisions *fall short of* the number five, there are several cases in which that number is *exceeded*

Thus the group Fringillinæ has *six* subdivisions; Pyrrhulinæ has *six*; Meliphagidæ *nine*; Tetraonidæ *six*; Ardeadæ *six*, or including Grus (which is apparently omitted through inadvertence), *seven*; and Alcadæ has six.

I feel bound to state, that, notwithstanding these objections, the 'Classification of Birds' is an exceedingly useful manual of ornithology, and it must be regretted that the mass of original observations which it contains is intermixed with so much that is of a visionary nature.

Note.—The questions which are the subject of the above paper were discussed at much length in the Philosophical Magazine, in 1823 and 1825. The reader is referred to vol. lxii. p. 192, 255, 271; vol. lxv. p. 105, 183, 372, 428; vol. lxvi. p. 172: also to Phil. Mag. and Annals, New Series, 1830, vol. vii. p. 431; vol. viii. p. 52, 131, and 200.—Ed.

XXIV.—*Catalogue of the Land and Freshwater* Mollusca *of Ireland.* By Wm. Thompson, Vice-President of the Natural History Society of Belfast.

[Continued from p. 126.]

Class II. CONCHIFERA, Lam.

Fam. 1. Cyclades.

Gen. 1. Cyclas, Lam.

1. *C. cornea*† Lam. Gray, Man. p. 280. pl. 1. f. 2; Turt. Man. p. 13. pl. 1. f. 2.
   C. rivalis, *Drap.* p. 129. pl. 10. f. 4, 5.
   Cardium corneum, *Mont.* p. 86.

Commonly distributed over the island, occurring in small ponds, &c., as well as lakes and rivers—the var. β. of Jenyns and other varieties not unfrequent. In summer I find the *C. cornea* of all sizes abundant in masses of *Conferveæ*, floating on the surface of the water.

2. *Cyclas lacustris*, Turt. Gray, Man. p. 281. pl. 1. f. 3.
   C. calyculata, *Drap.* p. 130. pl. 10. f. 13, 14; Turt. Man. p. 14. f. 3.
   Cardium lacustre, *Mont.* p. 89.

Is rare and local in Ireland—occurs in the east and south. To Mr. R. Ball of Dublin, I am indebted for specimens which were taken by him many years ago in a pond at Tallaght, a few miles from the metropolis; he has also procured some at Youghal—in Mr. Hyndman's cabinet is a specimen from another locality in the south. By Mr. T. W. Warren of Dublin, this *Cyclas* has been obtained in a pond in the Phœnix Park, and in the Grand Canal near that city, and by Dr. Coulter in Lord Roden's demesne, Dundalk. Mr. Hincks has lately procured it near Cork. As the *C. lacustris* is local in En-

† Mr. Gray's observation on the local distribution of *Cyclas rivicola* (Man. p. 34.) induces me to mention that I have obtained it in the canals about Leamington, Warwickshire. I have not seen any specimens that could properly be authenticated as Irish.

gland likewise, the additional habitat of Stow Pool, Lichfield, may be given, where I procured it in July, 1836.

Gen. 2. Pisidium, Pfeiffer.

1. *P. obtusale*†, Pfeiffer? Jenyns, Monog. p. 13. pl. 20. f. 1—3; Gray, Man. p. 282. pl. 12. f. 149.

This, with the exception of *P. Henslowianum*, would seem to be the rarest of the *Pisidia* in Ireland. In two localities in the county of Down it has occurred to me—in a drain cut through clay soil in a brickfield near Bangor, and in a pond at Portavo, the seat of D. Ker, Esq. M.P. A single specimen has been taken at Finnoe (county Tipperary) by Edw. Waller, Esq.

2. *Pisidium nitidum*, Jenyns, Monog. p. 16. pl. 20. f. 7, 8; Gray, Man. p. 283. pl. 12. f. 150.

Is somewhat generally distributed in Ireland. It is abundant in a cold turfy deposit conveyed by a mountain stream to a pond at Wolfhill‡ near Belfast; and on the *Utricularia vulgaris* growing in stagnant pools, excavated in brick-making close to the town—these places are of a very different nature, the pond at the former being supplied with clear spring water, and at an elevation of nearly 600 feet above the sea, the latter but a few feet above it, and supplied only with rain water. In the west, I have obtained this species in Lough Gill, county Sligo. From about Portarlington it has been sent me by the Rev. B. J. Clarke, and from Finnoe by Edw. Waller, Esq.

3. *Pisidium pusillum*, Jenyns, Monog. p. 14. pl. 20. f. 4—6; Gray, Man. p. 283. pl. 1. f. 7.

Is the most common of the genus in Ireland, and universally distributed. It is generally to be met with in ponds, drains, &c.; but in marshy spots, both in this country and in Scotland, I have found it in company with, and adhering to, the same stones as land Mollusca which inhabit such places, as *Vertigo palustris*, &c. In the north and south of Ireland I have procured it among moss, which was kept moist only by the spray of the waterfall.

4. *Pisidium pulchellum*, Jenyns, Monog. p. 18. pl. 21. f. 1—5§; Gray, Man. p. 284. pl. 12. f. 151.

This handsome and well-marked species is generally distributed over the island. It inhabits stagnant and running water of the least as well as greatest extent, and at the same time and place may be found on various subaquatic plants, and buried in the mud—the largest and finest specimens I have procured were from the gently flowing river Main, near its junction with Lough Neagh.

† All the *Pisidia* about to be noticed, have been determined from comparison with English specimens favoured me by the Rev. L. Jenyns and Mr. Alder.

‡ A minute leech preys much on the *P. nitidum* and *P. pusillum*, which are found here in company.

§ All the varieties are found in Ireland—of var. δ, a single specimen has been obtained by the Rev. B. J. Clarke near Portarlington. Mr. Jenyns is now inclined to consider this a distinct species. See Gray, Man. p. 285.

5. *Pisidium Henslowianum*, Jenyns, Monog. p. 20. pl. 21. f. 6, 7; Gray, Man. p. 285. pl. 1. f. 6.

Cyclas appendiculata, *Turt. Man.* p. 15. f. 6.

The addition of this species to our fauna is due to Edw. Waller, Esq., who has favoured me with the inspection of a few specimens which he procured at Finnoc, county Tipperary.

6. *Pisidium amnicum*, Jenyns, Monog. p. 21. pl. 19. f. 2; Gray, Man. p. 285. pl. 1. f. 5.

Cyclas amnica, *Turt. Man.* p. 15. f. 5.

Cardium amnicum, *Mont.* p. 86.

Cyclas palustris, *Drap.* p. 131. pl. 10. f. 15, 16.

Although not very common, is widely distributed over the island, and is known to me as occurring in every portion except the extreme south. Capt. Brown noticed as localities—"in a stream near Clonooney; in the Grand Canal, and in the Liffey, plentiful," p. 508.—in this river it attains a very large size. In the river Main, near its junction with Lough Neagh; in the rejectamenta of this lake near Toome; and in that of the river Lagan near Belfast, I have found the *P. amnicum*. Ballitore (county Kildare), Limerick, and Miltown Malbay are noticed by Mr. W. H. Harvey as localities from the river Barrow near Portarlington, the species has been sent me by the Rev. B. J. Clarke.

7. *Pisidium cinereum*, Alder, Supp. to Catal. in Newc. Trans.; Gray, Man. p. 286.

Is not common, but is widely distributed in Ireland, being found in the north, east, west, and south. In Sept. 1833, I first met with it in a moist spot in the wood at Holywood House, county Down, and have since obtained a very few specimens in different parts of this county, and of Antrim. Among *Pisidia* collected at Youngrove near Middleton (county Cork), by Miss M. Ball; at Killeeran (county Galway) and Portarlington, by the Rev. B. J. Clarke; and in the neighbourhood of Dublin by T. W. Warren, Esq., is the *P. cinereum*.

Fam. 2. Unionidæ, Gray, Man.

Gen. 1. Anodon, Oken.

A. cygneus, Turton, Man. p. 17. f. 8; Gray, Man. p. 289. pl. 1. f. 8.

Anodonta cygnea and A. anatina, *Drap.* p. 133, 134. pl. 12. f. 1, 2.

Mytilus cygneus, *Mont.* p. 170.

The *Anodon* is known to me as found in suitable localities all over the island, except in the extreme south. The *Anodonta intermedia*, Pfeiffer, 1. 113. t. 6. f. 3, I have obtained in the rejectamenta of the Lagan Canal near Belfast. Specimens from the Grand Canal near Dublin, favoured me by Mr. R. Ball, are the *A. cygnea*, Pfeiffer, 1. 111. t. 6. f. 4; and Rossmassler, fig. 342; and in Mr. Hyndman's collection is a very fine specimen $3\frac{1}{4}$ inches long and $6\frac{3}{4}$ broad from

the Moyntaghs, county Armagh. From the Grand Canal also and the river Shannon I possess specimens of the *A. anatina*, Pfeiffer, 1. 112. t. 6. f. 2; and from this last locality likewise I have the *A. cellensis*, Pfeiffer, 1. 110. t. 6. f. 1, and Rossmassler, fig. 280.—of this last I have had the advantage of a comparison with English specimens kindly sent me by Mr. Alder, and named "*A. cellensis*, Pf." From the *Anodon*, varying so much, not only according to locality, but in the same waters, I cannot coincide with the authors who make so many species. The four forms here noticed, I venture with Mr. Gray to consider but one species—of the Irish specimens which I have critically compared, none exactly agree with the *A. ventricosa* or *A. ponderosa* of Pfeiffer. W. R. Wilde, Esq. of Dublin, informs me that *Anodons* are thrown up in quantities on the shores of Lough Schur, county Leitrim, where they are eaten by the peasantry —*Sliggaun* is the common name applied to the *Anodon* in the north of Ireland †.

Gen. 2. Alasmodon, Say.

A. margaritiferus, Gray, Man. p. 293. pl. 2. f. 9.

Unio margaritiferus, *Turt. Man.* p. 19. f. 9.

Unio margaritifera, *Drap.* p. 132. pl. 10. f. 17—19. and pl. 11. f. 5.

Mya margaritifera, *Mont.* p. 33.

This has for a long period been on record as an Irish shell; from papers published on the subject in the Philosophical Transactions, &c., Pennant drew the information which appears in his 'British Zoology.' It is indigenous to several of the northern counties, and to the south. By Capt. Brown it is noticed as found "in the river Slaney, Enniscorthy," p. 505. In the cabinet of Mr. Hyndman of Belfast, are specimens from the river Bann and from the county of Donegal. This species inhabits some of the tributary streams of Lough Neagh, and is plentiful in the neighbourhood of Omagh, county Tyrone, where I have been informed it was taken in such quantity in 1839, that the prisoners in the jail were employed in breaking the shells for manure. Mr. Humphreys of Cork, notes it as abundant at Inchigeela, and as inhabiting the small rivers which run through Blarney and Glanmire (county Cork)—at Curraghmore

† The following note on the species of *Anodon* and *Unio*, which in the course of a forenoon in July, 1836, I obtained alive in the river Avon near Leamington, Warwickshire, may not be out of place here.

Anodon. A fine series of specimens, from nine lines in length to full size, does not agree exactly with any species as represented by Pfeiffer (3 Parts) or Rossmassler (10 Parts)—according to the views of these authors they would constitute two or three species. They do not correspond with any of my Irish specimens.

Unio pictorum, identical with specimens from the neigbourhood of London, presented by Mr. Alder.

"*Unio tumidus*, Pfeiffer," agreeing with shells from Belgium, so named, which I owe to the kindness of M. Michaud.

"*Unio rostrata*, Lam. Mich.," according to examples from the north of France, sent me under this name with the last. The number of species (so called) in the genus *Unio* is surely, like that in *Anodon*, quite too great.

(county Waterford), it is stated by Mr. R. Ball to be found[1]. The form to which M. Michaud has applied the name of *Unio Roissyi* is common to several localities in Ireland.

The following Catalogue at the same time exhibits the number of British species which Ireland possesses, and according to the present state of our information, those likewise in which the country is deficient. In the Table, the columns headed "elsewhere in north," &c. are used only with reference to species *not* enumerated in the preceding column or columns, and to show that geographical position is not the cause of absence; thus, for instance, *Helix virgata* is not found about Belfast, but occurs in the north of the county of Antrim. The genera *Arion* and *Limax* were altogether omitted in most of the Catalogues supplied me. The Catalogue for Belfast[2] is on my own authority: Dublin, various; Limerick and Miltown Malbay, William Henry Harvey, Esq.; Cork, Mr. John Humphreys (1834) and the Rev. Thomas Hincks (1840)—the species added by the latter gentleman are marked thus†; Youghal (county Cork), Miss Mary Ball; La Bergerie near Portarlington (Queen's county), Rev. Benjamin J. Clarke; Finnoe near Burrisakane (Tipperary), Edward Waller, Esq.[3]

BRITISH ISLANDS.		IRELAND.	North.		East.		West.			South.			Central ?	
			Belfast.	Elsewhere in North.	Dublin.	Elsewhere in East.	Limerick.	Miltown Malbay.	Elsewhere in West.	Cork.	Youghal.	Elsewhere in South.	La Bergerie.	Finnoe.
1	Neritina fluviatilis	1	...	...	*	...	*	...	...	*†	...	...	...	*
2	Assiminea Grayana													
3	Paludina vivipara	2	...	*										
4	—— achatina													
5	—— tentaculata (P. impura)	3	*	...	*	...	*	...	...	*†	*	...	*	*
6	—— ventricosa													
7	Valvata piscinalis	4	*	...	*	...	*	...	...	*	...	...	*	*
8	—— cristata (V. spirorbis)	5	*	...	*	...	*	...	...	*†	...	...	*	*
9	Arion ater	6	*	...	*	...	*	...	...	...	*	...	*	
10	—— hortensis	7	*	...	...	...	...	...	...	...	...	...	*	
11	Limax maximus	8	*	...	*	...	*	...	...	...	*	...	*	
12	—— flavus (L. variegatus)	9	*	...	...	...	...	...	...	...	*	...	*	
13	—— carinatus	10	...	...	...	...	...	...	*	...	...	...	*	
14	—— agrestis	11	*	...	*	...	...	...	*	...	...	...	*	
15	—— brunneus													

[1] *Unio pictorum* is noticed by Dr. Turton, in his 'Catalogue of Irish Shells,' as found in "rivers about Cork." The species is not known as native to my correspondents in the south, and I am disposed to believe was erroneously inserted in the catalogue.

[2] All the species marked with an asterisk in the column headed "Belfast" have been obtained within four miles of the town.

[3] The prevailing geological features of the neighbourhood of Belfast are trap, chalk, greensand formation, variegated marl formation and grauwacke; of Dublin, mountain and calp limestone, granite and quartz-rock; of Limerick, Cork, and Youghal, "limestone and old red sandstone" (Griffith); of Miltown Malbay, "coal-shale and sandstone" (Griffith); of La Bergerie and Finnoe, mountain limestone.

BRITISH ISLANDS.		IRELAND.	North.		East.		West.			South.			Central?	
			Belfast.	Elsewhere in North.	Dublin.	Elsewhere in East.	Limerick.	Milltown Malbay.	Elsewhere in West.	Cork.	Youghal.	Elsewhere in South.	La Bergerie.	Finnoe.
16	Vitrina pellucida	12	*	...	*	...	*	*	...	*	*	...	*	*
17	Testacella haliotidea	13	...	...	...	...	...	...	...	...	*			
18	Helix aperta													
19	—— aspersa	11	*	...	*	...	*	*	...	*	*	...	*	*
20	—— hortensis	15	...	*	*	...	...	...	...	*	...	...	*	
21	—— hybrida	16	...	*										
22	—— nemoralis	17	*	...	*	...	*	*	...	*	*	...	*	*
23	—— Pomatia													
24	—— arbustorum	18	*	...	*	...	...	...	...	...	...	*		
25	—— obvoluta													
26	—— lapicida													
27	—— pulchella	19	*	...	*	...	*	*	...	*	*	...	*	*
28	—— limbata													
29	—— Cantiana													
30	—— Carthusiana													
31	—— fusca	20	*	...	*	...	*	...	...	*	*			
32	—— revelata													
33	—— fulva	21	*	...	*	...	...	*	...	*	...	...	*	*
34	—— aculeata	22	*	...	*	...	...	*	...	*	...	...	*	*
35	—— lamellata (H. Scarburgensis, Bean.)	23	*	...	...	*	...	...	*	*	...	...	*	
36	—— granulata	24	...	...	...	...	*	...	...	*				
37	—— sericea	25	*											
38	—— hispida	26	*	...	*	...	*	*	...	*	*	...	*	*
39	—— rufescens	27	...	*	*	...	*	*	...	*	*	...	*	*
40	—— concinna	28	*	...	*	...	...	...	*	...	*	...	*	*
41	—— virgata	29	...	*	*	...	...	...	*	*	*	...	*	
42	—— caperata	30	...	...	*	...	...	...	...	*	...	...	*	
43	—— Pisana	31	...	*										
44	—— cricetorum	32	...	*	*	...			...	*	*	...		
45	—— rotundata	33	*	...	*	...	*	*	...	*	*	...	*	*
46	—— umbilicata	34	...	...	*	...	*	*	...	*	*	...	*	*
47	—— pygmæa	35	*	...	...	*	...	*	...	...	...	...	*	*
48	—— cellaria	36	*	...	*	...	*	*	...	*	*	...	*	*
49	—— alliaria	37	*	...	*	...	...	*	*	*	*	...	*	
50	—— pura	38	*	...	*	...	...	...	*	*	...	...	*	*
51	—— nitidula	39	*	...	*	...	*	...	...	*	*	...	*	*
52	—— radiatula	40	*	...	*	...	...	...	*	*	...	...	*	
53	—— lucida	41	*	...	...	...	...	...	...	...	...	...	*	*
54	—— excavata	42	...	...	...	...	...	...	*	*				
55	—— crystallina	43	*	...	*	...	*	...	...	*	*	...	*	*
56	Succinea putris	44	*	...	*	...	*	*	...	*	*	...	*	*
57	—— Pfeiffer?	45	*	...	...	*	*	...	...	*		...	*	*
58	—— oblonga													
59	Bulimus Lackamensis													
60	—— obscurus	46	...	*	*	...	...	...	...	...	...	...	*	
61	—— acutus	47	...	*	*	...	...	...	*	...	*	...	*	
62	—— lubricus	48	*	...	*	...	*	*	...	*	*	...	*	*
63	Azeca tridens													
64	Achatina acicula	49	...	...	*	...	*	*	...	...	*	...	*	*
65	Pupa umbilicata	50	*	...	*	...	*	*	...	*	*	...	*	*
66	—— Anglica	51	*	...	*	...	...	*	...	*	*	...	*	
67	—— marginata	52	*	...	*	...	...	*	...	...	*	...	*	
68	—— juniperi													
69	Vertigo edentula	53	*	...	*	...	...	...	...	*	...	...	...	*
70	—— cylindrica													
71	—— pygmæa	54	*	...	*	...	...	*	...	*	*	*	*	*

BRITISH ISLANDS.		IRELAND.	North.		East.		West.			South.			Central P	
			Belfast.	Elsewhere in North.	Dublin.	Elsewhere in East.	Limerick.	Milltown Malbay.	Elsewhere in West.	Cork.	Youghal.	Elsewhere in South.	La Bergurie.	Finnoe.
72	Vertigo alpestris													
73	—— substriata	55	*	...	*	...	*	*						
74	—— palustris	56	*	...	...	...	...	...	...	...	...	...	*	*
75	—— pusilla	57	*	...	*	...	...	*						
76	—— angustior	58	...	...	...	...	...	*						
77	Balea perversa	59	*	...	*	...	*	...	...	*	*	...	*	*
78	Clausilia bidens	60	...	*										
79	—— biplicata													
80	—— Rolphii													
81	—— dubia													
82	—— nigricans	61	*	...	*	...	*	...	...	*	*	...	*	*
83	Carychium minimum	62	*	...	*	...	*	*	...	*†	*	...	*	*
84	Acme fusca	63	*	...	*	...	...	*	...	*†	...	...	*	*
85	Limnæus auricularius	64	...	...	*	...	*	*	...	...	*	...	*	*
86	—— peregor	65	*	...	*	...	*	*	...	*	*	...	*	*
87	—— stagnalis	66	*	...	*	...	*	...	...	*	...	...	*	*
88	—— palustris	67	*	...	*	...	*	...	...	*†	*	...	*	*
89	—— truncatulus	68	*	...	*	...	*	...	...	*†	*	...	*	*
90	—— glaber	69	...	...	...	...	...	...	...	*	...	...		
91	—— involutus	70	...	...	...	...	...	...	...	...	...	*		
92	Amphipeplea glutinosa													
93	Ancylus fluviatilis	71	*	...	*	...	*	*	...	*	*	...	...	*
94	—— lacustris	72	*	...	*	...	*	...	...	...	...	...	...	*
95	Physa fontinalis	73	*	...	*	...	*	...	...	*	*	...	*	*
96	—— hypnorum	74	*	...	*	...	*	...	...	*	*	...	*	*
97	Planorbis corneus	75	...	...	...	*	...	...	...	...	...	...	*	
98	—— albus	76	*	...	*	...	*	...	...	*†	...	...	*	
99	—— lævis	77	*	...										
100	—— imbricatus	78	*	...	*	...	*	...	...	...	...	...	*	*
101	—— carinatus	79	...	*	*	...	...	...	*	...	*	...	*	
102	—— umbilicatus (P. marginatus, Drap.)	80	*	...	*	...	*	*	...	*†	*	...	*	*
103	—— vortex	81	*	...	*	...	*	...	...	*	*	...	*	*
104	—— spirorbis[1]	82												
105	—— nitidus	83	*	...	*	...	*	...	...	*	...	...	*	*
106	—— contortus	84	*	...	*	...	*	...	...	*	...	...	*	*
107	Segmentina lineata													
108	Cyclostoma elegans	85	...	...	*	...	...	...	...	...	*			
109	Cyclas rivicola													
110	—— cornea	86	*	...	*	...	*	*	...	*	*	...	*	*
111	—— calyculata	87	...	...	*	...	...	...	...	*†	*			
112	Pisidium obtusale	88												
113	—— nitidum	89	*	...	...	...	...	...	...	...	...	...	*	*
114	—— pusillum	90	*	...	*	...	...	...	*	*†	...	...	*	*
115	—— pulchellum	91	*	...	*	...	...	...	...	*†	...	...	*	*
116	—— Henslowianum	92												
117	—— amnicum	93	*	...	*	...	*	*	...	...	...	...	*	
118	—— cinereum	94	*	...	*	...	...	...	*	...	*	...	*	
119	Anodon cygneus	95	*	...	*	...	*							
120	Alasmodon elongatus	96	...	*	...	...	...	...	*	*				
121	Unio pictorum													
122	—— tumidus													
123	—— ovalis													
124	—— Batavus													

[1] For reasons stated in the text, p. 124, (No. XXV.) *P. vortex* and *P. spirorbis* are not marked separately in the catalogue.

Those acquainted with Mr. Gray's catalogue, will perceive that four of the species it contains are omitted,—the three *Conovuli* and *Dreissena polymorpha*, which is an introduced and not an indigenous species. Of the twenty-eight species which Great Britain and her islands would thus seem to possess over Ireland, it must be stated that Turton has enumerated four as Irish, viz. *Helix lapicida*, *H. Cantiana*, *Limneus glutinosus*, and *Unio pictorum*; but as he sometimes introduced species without sufficient reason, and as these are unknown to my correspondents and to myself, they are omitted—if correctly placed in our fauna by that author they will in all probability yet be found. *Paludina achatina* is included by Mr. Gray (Man. p. 34), but on what authority he could not recollect when I lately saw him at the British Museum. I have been told of the occurrence of a few species, which, in the absence of sufficient proof, are not included in the catalogue. Two of the Helices,—*H. aperta* and *H. revelata*,—have been introduced to the British list from Guernsey.

It appears from the foregoing catalogue, that four generic forms indigenous to England have not been found in Ireland, *Assiminea*, *Azeca*, *Segmentina*, and *Unio*; these comprise seven species, if four Unios be admitted as distinct.

It may be desirable to dwell for a moment on the distribution of those species in Great Britain which have not been found in Ireland. Of these, *Assiminea Grayana* is confined to the south-east of England, and is "seldom found out of the reach of brackish water." *Paludina achatina* and *P. ventricosa* are not generally distributed in England, and are unknown in Scotland*. *Limæ brunneus* has been observed only at Newcastle and Berwick. *Helix aperta* (*H. naticoides*, Drap.) and *H. revelata* have not been found in Great Britain, but only in the island of Guernsey. *H. obvoluta* would seem to be confined to Hampshire, as *H. limbata* is to one quarter of the neighbourhood of London. *H. Pomatia* is found chiefly in the chalk districts of the south of England. *H. Cantiana* now occurs from the south to Newcastle-upon-Tyne, but is believed to have been introduced to this northern locality with ballast. *H. Carthusiana* (*H. Carthusianella*, Drap.), is confined to the south-east; *H. lapicida* prevails in the south, and along the eastern portion of England—not one of the above *Helices* is found in Scotland. *Succinea oblonga* has been obtained only in three localities, North Devon, and in the neighbourhood of Swansea and Glasgow. *Bulimus Lackamensis* is a south of England species—to Scotland it is unknown. *Azeca tridens* is widely distributed over England, and is also indigenous to the south of Scotland. *Pupa Juniperi* would appear to be chiefly confined to the south of England and South Wales. *Vertigo cylindrica* is very rare, and has been found but in three British localities—the neighbourhood of Bristol, of Edinburgh, and in the isle of Skye. *Vertigo alpestris* has been procured only in two stations—in Lanca-

* A manuscript catalogue of the land and freshwater mollusca of Scotland, favoured me by my friend Edward Forbes, Esq. is my authority.

shire and Northumberland. *Clausilia biplicata* is confined to the south of England; *C. Rolphii* to one or two localities in the south-east; *C. dubia* is, I believe, as yet known only to the north of England. *Limneus glutinosus*, *Cyclostoma elegans*, and *Cyclas rivicola*, are somewhat widely diffused in England, but are unknown to Scotland. *Segmentina lineata* is noticed by Mr. Gray as a south of England species, but is included in Mr. Forbes's list of Scottish mollusca. The genus *Unio*, as now restricted, becomes rare towards the north of England, and is not found in Scotland. The species of land and freshwater mollusca indigenous to Ireland, assimilate with those of Scotland much more nearly than those of England. About one-half of the species in which Ireland is deficient prevail chiefly in the portion of England which lies to the south of Ireland.

I should, perhaps, in conclusion, have ventured to offer some remarks on the causes which appear to influence the distribution of our Irish species, but the views put forward in my friend Mr. Forbes's excellent 'Report of the Distribution of Pulmoniferous Mollusca in the British Isles,' published in the volume for 1839 of the Report of the British Association for the Advancement of Science, renders unnecessary anything I could say upon the subject.

APPENDIX.

My notice of the genera *Arion* and *Limax* at the beginning of this article is so scanty, that I here avail myself of very full and interesting observations on the species appertaining to them, since favoured me by Mr. Clarke, who much more than any one in this country has bestowed attention on the subject.

Arion ater.

A. Empiricorum, Férus., t. 2.

La Bergerie, Queen's county; county Galway. Too abundant in both places, varying from the light yellow-coloured variety through all the shades of brown or ochre to deep black. The brown variety seems to predominate in Killereran (county Galway) meadows and woods, but I have repeatedly observed the two colours indiscriminately mixed together in precisely the same localities, both in fields and gardens. The yellow, which I have never taken of the full size, is mostly confined to the decaying pieces of wood found among damp moss. I have not noticed the variety with the scarlet foot, as in fig. 2. t. 2. Fér. I have seen two individuals busily engaged devouring a snail (*H. aspersa*), both their heads being introduced within the shell: the snail appeared to be fresh killed.

Arion hortensis.

A. des Jardin, Férus., t. 2. f. 4—6.

Var. *α*. f. 6. Fér.

Var. *β*. Pfeiffer.

La Bergerie and county Galway. By no means scarce. Férussac's figures agree accurately with mine, but are represented of larger dimensions than any I have seen. I have taken the young of a very minute size with the orange foot, and the colours equally as

deep as in adult individuals. Var. α. f. 6. Férus., is not more abundant here than the orange-footed one, which I have never succeeded in finding at Killereran, where the variety is common in violet beds. The following from Férussac agrees curiously with my habitat: "Elle se cache le jour sous les tiges de violettes de fraisiers et des autres plantes touffues." Mr. Alder remarks of the variety, "The variety only, if such it be, has yet been noticed in this country." I have never discovered even the rudiment of a shell in any of them.

N.B. I have before me at present an *Arion*, found along with *A. hortensis*, var. β. Pfeiff. The only character it possesses in common with it, is in the position of a yellow-coloured fascia running round the body, which is of a dusky brown, the sides greenish-yellow, the fascia becoming indistinct on the shield. It differs materially in colour from any variety of the *A. ater* I have met with; and what might characterize it as belonging to this species, is the shape and colour of the tentacles and head, the former being much more elongated than in *A. hortensis*, and of a shining black colour. The edge or side of the foot is likewise similar to *A. ater*, being greenish-yellow, marked with the peculiar transverse black lines. Its mucus is yellow-coloured, whereas that of *A. ater* is whitish, or colourless. Since writing the above, I have obtained a second specimen, similar in every respect to the former, except the fascia, which is not so distinct.

Limax maximus.

L. antiquorum, Férus., t. 4.

La Bergerie. Killereran and Monivea, county Galway. I have taken in each locality mentioned, one of the three varieties of Férussac, t. 4. Fig. 1. var β. (var. α. Drap.), among violets, Killereran; his figure is good, "sans tache distinctes," &c. Fig. 7. var. ν. Férus., is the La B. variety. Fig. 8. var. ζ. Férus., closely resembles specimens taken in Monivea churchyard, beautifully and distinctly spotted, the ground colour not so light as in Férussac's figure*.

Limax agrestis.

Limas agreste, Férus., t. 5. f. 7—8.

L. filans, Young, var. ν. Fér.

Queen's county, and county Galway. Common, of all shades and degrees of colour and markings, from the pale yellowish-white of *L. filans* to the darkest variety of reddish-brown. *L. filans* is equally abundant. Yesterday, July 21st, I had the gratification of seeing them repeatedly let themselves drop down to the table from the lid

* I have recently met with a very remarkable variety of this species in the Spire hill, Queen's county, and which I do not find described; it is as follows:—The entire animal of a deep shining black, with the exception of the keel and central band of the foot, which are white. A casual glance at this variety would scarcely suffice to recognise it; but the shape of the animal, the shell, and the keel, at once determine it as *L. maximus*. In one individual there were a few indistinct blotches of a lighter colour on the sides.

of a tin box, where, for the purpose of taking some drawings of the different varieties, they were held. A similar feat was performed by the full-grown and dark varieties, which were on the same box with *L. flans*, but they did not appear to possess the same facility, and were more reluctant in resorting to this expedient for escaping from the confined space on which they were placed. Turton, in his description of the shell of this species, makes no mention of the membranaceous margin. I have now eight specimens before me, taken from the animals this morning; the following is an attempt at their description: shell rather variable, in shape usually oblong oval, somewhat larger than those found in *L. Sowerbii*, but much thinner, and without the same abrupt thickening in the centre, with a membranaceous edge, all of them concave, as much so in proportion to size as in *L. parma*.

I have not been able to recognise the *Limax brunneus* of Drap., in either county, or elsewhere.

Limax variegatus ?

L. flavescens, var. *v.* Fér., t. 5. f. 3. ?

La Bergerie; Monivea; county Galway. Common on beech and other trees in moist woods; they somewhat resemble in colour var. *v.* f. 3. *L. flavescens*, Férus. All the Queen's county and Galway specimens have the yellowish dorsal streak, both in young and adults. I have not as yet found it in such a locality as is ascribed to it by Férussac: he observes, "Elle infeste les caves où elle se tient ordinairement contre les murailles." I have never taken it elsewhere than on the trunks of trees (particularly beech), in the crevices and under the moss. The remarkable transparency of this species does not appear to be noticed as a specific character. After rain, I have seen them in numbers gliding down the smooth bark of the beech from feeding on the higher foliage, their bodies appearing between the light like pellucid jelly, through which their internal organization can be indistinctly traced.

While these notes on the *Limacidæ* were passing through the press, I felt desirous of consulting M. Bouchard's memoir; and no sooner was this communicated to Mr. Gray (by Mr. Thompson), than he with great kindness forwarded his copy of it to Ireland for that purpose. I suspected that the *Limax*, here doubtfully introduced as "*L. flavescens*, var. *v.* Fér.," might perhaps be referred to *L. arborum*, on account of its possessing certain characters and habits differing from what is contained in any description of *L. variegatus* and its varieties. I consequently have compared my specimens carefully with M. Bouchard's description of *L. arborum*, and was much gratified to find a perfect agreement in the specific distinctions, as well as in the peculiar habits of the animal. This *Limax* is so well marked as to leave no doubt on my mind of its identity with that species. I have recently obtained unquestionable specimens of *L. variegatus* in La Bergerie garden, which are referable to "*L. variegatus*, Fér., var. *α.* t. 5. f. 1. Luteus aut succineus." They are precisely similar to specimens taken by R. Ball, Esq., in a garden at Youghal, and now in his collection. In spirits the yellow colour disappears.

Limax carinatus.
Limax Sowerbii, Férus. ?

La Bergerie; Moniven; county Galway, under stones in fields, and in tufted plants in gardens. There is not any figure in Férussac to which I could refer the La B. varieties (if they are varieties). Nor does Mr. Gray's description agree well with them; the word "tesselated" does not accurately describe the distribution of their colours. Their head and tentacles are never "black," but always *gray*, or blueish-gray. The usual colour is yellowish-brown, often approaching to dusky, sides pale, gray *clouded* with light yellow, head and tentacles blueish-gray.

Variety. Deep dusky or nearly black, sides pale gray, head and tentacles blueish-gray.

The young have the keel yellow-coloured, which in adults is generally the same colour as the back. The extreme dark colour of the variety led me at first to confound it with the *L. gagates* of Férus. He remarks of one of the varieties of *L. gagates*, "Elle est d'un gris bluatre ou nouratre..... plus pale lateralement." I have seen but a single individual in Moniven; it was identical with the variety.

The internal shells are a size smaller than those of *L. agrestis*; they have no membrane on the edge, are opake, much thicker, and not concave; the peculiar thickening process in the centre gives them the appearance of having a marginal zone, or as if a smaller sized shell were placed on the top and centre of the larger, leaving a rather broad margin, which is usually of a rufous colour towards the top.

I find that this species is capable of forming a slimy thread in the same manner as *L. flavus*. Having placed one on a laurel, I was surprised by seeing it forthwith make use of this means for conveying itself in safety to the ground. I have since succeeded in making other individuals act in a similar way. The spinning limaces may be easily forced to do so by leaving them on an evergreen or other tree which may not be congenial to their tastes, when they will speedily effect their escape in this manner.

[Mr. Clarke has favoured me with living specimens of this *Limax*, from La Bergerie, and judging from descriptions and figures, I should not hesitate to consider it *L. Sowerbii*. A species, similarly keeled from the shield to the tail, and of which a very few specimens were obtained near Clifden, Connemara, during a tour made to the west of Ireland, in July 1840, by Mr. R. Ball, Mr. E. Forbes, and myself, corresponds more nearly with the *L. gagates*, as described and figured by Draparnaud, than with the British descriptions of *L. Sowerbii*. They are from half an inch to an inch in length, the head, back and sides blackish, the foot pale gray; in one individual the dorsal keel was narrowly margined with yellow. They were all found under stones in wet places.—W. T.]

Note.—On looking over the Appendix to Mr. Gray's edition of Turton, I find he quotes M. Bouchard Chantreux, in observing, that "the young of *Arion ater* is dull brown, with yellowish sides."

The Arion described above may probably be only such; but the youngest specimens I have ever taken of *A. ater* (and I have obtained them very young), were entirely of a light yellow, or greenish-yellow colour, in one or two instances having very obscure and similarly placed dusky fasciæ on the shield only. M. Bouchard supposes the *L. filans* of Hoy to be the young of his *L. arboreus*; from my experience, I feel assured of its being the young of *L. agrestis*, as I have almost always found it under stones, generally accompanying the full-grown *L. agrestis*, and very rarely "on trees."

BENJAMIN J. CLARKE.

La Bergerie, Aug. 5, 1840.

Additional localities may here be given for the following species:

Helix lamellata (H. Scarburgensis). Wood near the bridge of Errif, county Mayo, between Westport and Killery harbour.—W. T.

Helix radiatula. With last.

Helix lucida, Drap. Near Clifden, Connemara.—W. T.

Helix virgata.

When the first part of the paper was printed, I was unable to give a western locality for this species, but specimens collected within a few miles of Roundstone, on the coast of Galway, have since been sent me by Mr. William McCalla, of that place.

Helix hybrida.

The examples of this *Helix*, before alluded to in the present paper (p. 22), differed only from the ordinary *H. nemoralis* in having the lip of a rose colour or brown, and in its being margined with a white line. By R. Leyland, Esq., of Halifax (Yorkshire), I have lately been favoured with a number of specimens of *H. hybrida*, which bear much the same relation to *H. hortensis* that the former do to *H. nemoralis*. They are all yellowish-brown, with the lip varying from a rose colour to white. Mr. Leyland remarks, in reference to them, "The situation in which this *Helix* is met with, is on the banks of the canal between Keighly and Bingley, and about two miles from each place. The extent to which it is confined is not more than thirty paces in length, beyond which only an occasional straggler could be met with, and even then at no great distance from the principal station. *H. hortensis* and *H. nemoralis* are both found in the same place as *H. hybrida*, but are common along the whole line of the canal so far as I have examined, while the last seems confined to the small space before-mentioned, and is there rather numerous. The vegetation of this spot consists of the common grasses, *Rubi*, a few of the most common *Umbelliferæ* and nettles; upon the last of these a majority of the specimens were found."

In the south islands of Arran, situated near the entrance to Galway bay, the few following species were, in June, 1834, obtained by Mr. R. Ball and myself: *Helix nemoralis* (extremely large), *H. cellaria*, *H. crystallina*, *H. umbilicata*, *H. cricetorum* (one pure white), *H. hispida*, Mull.; *Clausilia nigricans* (rugosa), one of crystalline transparency, as were nearly all of *Pupa umbilicata*, which is here abundant.

XXV.—*On some Objections to the Theory of attributing the Natural Terraces on the Eildon Hills to the action of water.* By J. E. Bowman, F.L.S. & F.G.S.

My attention having been directed, during the late meeting of the British Association at Glasgow, to an account of a series of very interesting natural Terraces on the hills round Galashiels in Selkirkshire, in a late Number of Chambers's Edinburgh Journal *, I took the opportunity of returning through that district to ascertain, by personal inspection, how far they agreed with the description. As my time was limited, I did not attempt a detailed examination, and was unprovided with any instruments for verifying the relative heights and levels of the terraces, so circumstantially given in the above article. As that valuable publication is in every one's hands, I shall at once refer to the article in question, merely saying, that my own observations will be much better understood if the reader will previously consult it; that the number of the terraces is sixteen, and that they run along the sides of many of the hills round Galashiels, Melrose, Abbotsford, &c., in perfectly horizontal lines, and parallel to each other; and are, in the opinion of their discoverer, so many different ancient beaches or land-levels, at which the sea must successively have stood for long periods. The staple of the article is from Mr. Kemp's own notes; and I am satisfied, from the opinion I formed of his ability, geological knowledge, love of truth and unpretending diffidence, that full reliance may be placed upon what he has so carefully and perseveringly worked out. I regret that I could not altogether agree with his conclusions; and I offer the following observations with considerable diffidence, because I had only a single opportunity, and that a hurried one, of seeing a small part of the appearances he has so repeatedly and attentively studied. Having seen the Parallel Roads of Glen Roy some years ago, I was naturally led, from the description of these terraces, to expect something of the same appearance and character; though a moment's reflection would have convinced me, that had this been the case, they would long ago have attracted general notice, and could not have escaped the searching eye of Sir Walter Scott, from whose windows at Abbotsford, the Eildon hills, on which some of the clearest examples occur, form a prominent feature of the scenery †. The fact is, that neither when viewed

* No. 444, for 1st August, 1840.

† Not wishing to trust to my own recollections, I wrote to an old and talented friend, (J. F. M. Dovaston, Esq. M.A., West Felton, Shropshire,) whose intimate acquaintance with, and enthusiastic admiration of the

from a distant point, nor when standing upon or near them, do they anywhere exhibit to the eye the continuity, the parallelism, or the perfect horizontality, either of level or of surface, so strikingly displayed in those of Glen Roy. Indeed, they are for the most part so broken and interrupted, and the detached portions often so obviously deflected from the horizontal plane, notwithstanding a general parallelism, that it is difficult to conceive them to have been formed by water. I think that most geologists would pass through the district, and even walk over them, without being aware of anything peculiar, unless their attention were specially directed towards them. This obscurity naturally led me to a more close examination of the limited portions I had the opportunity of visiting; and as some of the appearances did not strike me as being the result of tidal action, I have thought that in the present state of our knowledge of them, the cause of truth might be advanced by directing the attention of geologists towards those points which seem to be still obscure, notwithstanding the conclusion at which we must arrive from the general coincidence of the levels across intervening valleys.

I first ascended the northern flank of the Eildon hills from the valley of the Tweed at Melrose, passing from the old red sandstone, which forms the general surface of the district, to the greywacke, and from it again to the red compact felspar, which has burst through both, and forms the greater portion

writings of Sir W. Scott, are surpassed by none, to ask if he could point out any passage showing that he was aware of the existence of these terraces. I quote a portion of his reply:—"I believe I can answer you with positive certainty, and, as you say, '*at once*,' (for my memory, as honest Parson Evans says, was always pretty 'sprag,') that though he very frequently, up and down, makes particular and fond mention of the Eildon hills, and places about Melrose, I am very sure he never notices any particular geological formation in those mountains, or surely it would have struck me, especially when similar to the Parallel Roads of Glen Roy, which I viewed with such intense interest in your society. In the 'Monastery' he gives a very minute and beautiful description, at some length, of a narrow valley above Melrose, there called Kennaquhair, down which a small river falls into the Tweed; but not one word of stone-ology, or any part of natural history, in which poets in general are miserably ignorant. From this censure, I must, however, except our matchless Shakspere, and old father Chaucer," &c. &c.

Had Sir W. Scott been aware of these terraces, he would surely have interwoven some notice of them with the story of Mary Avenel. How much to be regretted that his fine spirit should have passed away in ignorance of the most interesting natural feature of a district he has so well immortalized! But "*non omnes omnia possumus*;" and to use his own nervous language in another place, "they have a' their different turns, and some can clink verses,—and some rin up hill and down dale, knapping the chucky stanes to pieces wi' hammers, like sae mony roadmakers run daft,—they say it is to see how the warld was made!"

of the whole group. The eastern hill is for the most part covered with sward to the summit; so is the lower half of the middle one, the upper portion being nearly all naked rock. On the ascent to the uneven plain, or shoulder that connects the eastern with the middle hill, above mid-height, I perceived two or three of the terraces* upon the face of a great spur that shoots out from the latter above the beautiful ruin of Melrose Abbey. They seemed to range at about equal distances from each other, and to be from 80 to 100 yards wide; the upper being about three-fourths of a mile long, and nearly of equal width throughout. As I successively reached the level of each, I found the surface to be covered with vegetation, and to be far too uneven to have been formed or modelled by water. On attaining the plain or connecting shoulder just alluded to (which I took to be No. 10 of Mr. Kemp's series), I found the same inequality of surface, and also an evident general slope, not outwards from the hill towards the valley, but at right angles to that direction, and from a horizontal line that would have formed the beach when the water stood at that level.

On ascending the eastern hill the terraces between it and the middle hill were so obscure and broken up, and the intermediate slopes so irregular, that I could not trace them for any distance, or even in some places satisfy myself that they existed at all. It appeared (admitting they had once been there) that portions of them had subsequently slipped down, dividing horizontally into two or three, and then had rested in irregular and slanting positions on the intermediate spaces. The average slope of the hill here was 30 to 35 degrees, and the average deviation of the surfaces of these detached portions from the horizontal line, about 5 degrees; but this deviation was sometimes in one direction and sometimes in another; so that supposing a person were to walk along them, he would sometimes ascend, and sometimes descend. The diameter of the surface was also uneven, generally sloping outwards, but in one place inwards, the width being various, mostly from ten to twenty yards. In no one spot is the surface horizontal; yet, at the same time, it is necessary to say that, viewing them as a whole, they seem too uniform and regular to be accidental slips of detritus from above, and at first sight appear more like the remains of rude earthen entrenchments than the effect of any great natural cause. It

* I adopt this word for the whole series, though some of them are more properly shelves, or slight projections; and are so obscure, that Mr. Kemp told me he only discovered one half of them by turning the spirit level to those places on the opposite hills where he expected to find them.

would not affect the general truth of the formation of terraces by tidal action, to find occasional and slight inequalities of level; even if originally horizontal, such inequalities might be easily produced in the process of upheaving; and the real ground of surprise is that they should retain the uniform and perfect parallelism they do, as those of Glen Roy. But the deflections and discrepancies I now speak of are relative to the general surface of the terraces, and to each other, on the detached portions where they occur; and therefore, admitting them to have been sea-beaches, they must be occasioned by slips from increase of gravity of the mass, when raised out of the water.

On reaching the summit of the hill, the terrace No. 1 seems best developed on the S.S.E. side, and is extended into an irregular shaped plateau, whose surface, though approaching to a rude horizontality, is far too rounded and uneven to have been formed by the action of water. In one place, where the terrace can scarcely be traced, and where the deficiency might be attributed to a subsequent slip, there is no apparent accumulation below; but, on the contrary, a hollow or depression in the surface. On looking downwards on the S.E. side of the hill, I could see no other terrace below it.

The upper terraces of the middle hill may be comprehended in the above general description; their surfaces have many elevations and depressions, and for the most part slope outwards from the mountain. On both the hills, all that I examined consist of the same material, viz. a mass of angular fragments of the red compact felspar rock from above, the only difference being, that on the eastern hill they are mixed with a stiff red clay and covered with vegetable sward, while the upper ones of the middle hill have no such covering. I looked carefully on both, wherever I had the opportunity, for rounded pebbles, gravel, sand, or other drift, but without seeing a vestige of either. In the sequel I shall again allude to this peculiarity.

Looking back upon the group of the Eildons from the road between Melrose and Abbotsford, and all the way to Galashiels, several of the terraces on their northern face, which rises above Melrose and the broad valley of the Tweed, may be seen stretching in true horizontal lines of considerable length, the minor inequalities of level being lost in the general effect. This is an important fact in favour of their origin from water. I looked in vain for similar appearances on the opposite or north bank of the Tweed, on Cowden Knows, and up the valley of the Leader, in all which places the hills are lower and smoother, and for the most part covered with

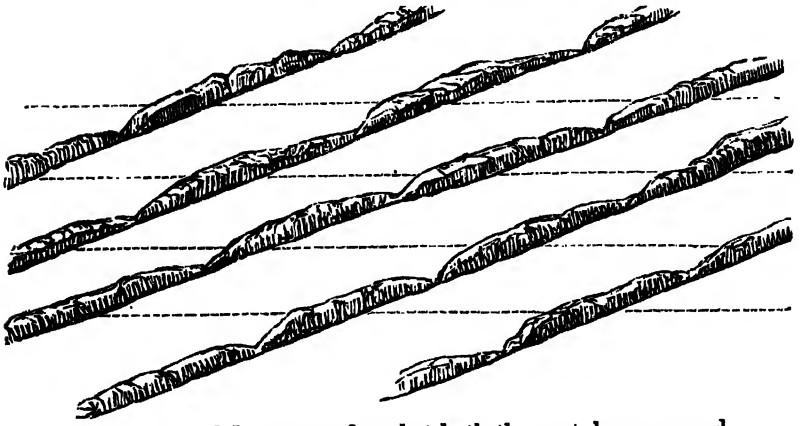
diluvium containing angular fragments of greywacke and trap rocks.

In the afternoon, Mr. Kemp kindly accompanied me on a hasty visit from Galashiels to Williamlaw. My time being limited and the evening advancing, he selected this hill as offering the best example of the terraces in the neighbourhood, for he had traced, more or less distinctly, detached portions of no less than eight of the whole series, between the summit and the base. Two or three of the lowest of these (7, 8, and 9 of his series,) are the broadest and most continuous, averaging 100, 120, and 130 feet wide respectively about the middle, where they appear to be swollen out, narrowing irregularly on each side till they are lost in the general slope of the hill. These occur on the south side of the hill, and front the valley of the Gala. On one of them the surface is raised in the middle or widest part, and declines each way towards the narrower extremities at an angle of 3 to 6 degrees, a vertical longitudinal section having this form:—

At first sight it appeared that both the greater width and the raised surface of the middle portion, might be caused by an accumulation of detritus from above; but on examination it was composed of the solid rock. On another, the central accumulation is so situated under a projecting rock, that it could not have found a lodgement there in falling from above; nor was there any trace of a furrow or ancient water-course which might have brought down diluvium, when this spot marked the level of the water. The natural slope of the hill in the neighbourhood of these lower terraces, forms an angle varying from 30 to 40 degrees.

A little to the westward of these, and higher up the hill, the series of inclined projecting ridges of hard greywacke rock, which are named in the article referred to as apparently contradictory, but are really confirmatory of the theory advanced, may be seen to greater advantage than either nearer the summit or the base. Regarding these, or rather the protuberances and intermediate indentations by which they are stated to be marked, as the *experimentum crucis* of the whole theory, I was anxious to satisfy myself of the coincidence of level between these points and the horizontal terraces; but after the best attention I was able to give, I regret to say, that whether from the unfavourable point from which I viewed them, with regard to perspective, or from the general ruggedness of the

outlines, and unaided by any instrument, my eye failed to recognize the points of intersection. The ridges themselves follow the slope of the hill to the west, and have an apparent dip of about six or eight degrees; but as the true dip of the beds composing them averages from 50 to 60 N.N.W., it is evident that their superficial outline has been determined by the slope of the hill, which intersects the beds diagonally and exposes their basset edges. In some parts they are very rugged and uneven, and project considerably above the general face of the hill; while the intervening spaces, which are so many sunken furrows, have a smooth covering of diluvium and sward, and an uniform and gradual slope corresponding with that of the ridges. As it is not easy by description alone to convey a correct idea of their combined form and character, I have constructed the following diagram of the appearance they should exhibit in perspective, according to the theory; but it shows them much more regular and uniform than they exist in nature, and marks the protuberances which Mr. Kemp says "range horizontally across them, and correspond in their respective levels with the terraces on the neighbouring hills." The shaded diagonal rows are the sloping ridges which rise out of the hollows, their curved tops showing the protuberances, and the dotted horizontal lines mark the supposed levels of the terraces; which, however, it must be remarked, do not appear here, but at corresponding heights in other places, and are only introduced to show the horizontal strike of the protuberances and intermediate indentations. This arrangement, as I have already observed, I failed to re-



cognize; and I must confess that both the protuberances and depressions appeared to me far too irregular and obscure to

support the opinion of their having been caused by the action of water, unless corroborated by being at corresponding levels with the terraces. I assume, however, on Mr. Kemp's authority, that such is the case. But as the terraces are believed to have been formed by tidal action, that cause, if it produced any effect at all upon the hard greywacke ridges, must have cut away those parts which appear as *indentations* (see the diagram), and which must therefore be considered as successively the actual lines of beach; whereas Mr. Kemp states, "that the *protuberances* correspond in their respective levels with the terraces on the neighbouring hills." Again, the broad inclined slopes between the elevated ridges, are covered with green sward, and form inclined planes with pretty uniform surfaces. Though I could nowhere cut through the sward to the rock below, I think it probable that these inclined hollows do "indicate the situation of softer intermediate beds which the action of the sea has washed away, leaving the harder beds comparatively bold and prominent*." But here another difficulty meets us: if the tidal action was sufficient to produce so marked an effect upon the projecting hard greywacke ridges, the softer intermediate beds must have been washed away to a much greater extent than they have been, and would have shown greater inequalities of surface; whereas they are generally smooth and uniform, and but a few feet below the ridges.

Again, wherever, either on the terraces or the intermediate slopes, fragments of the rock were exposed, they were angular and rough, with sharp edges, and did not show the least appearance of having been rounded or acted on by water. I could not find on Williamlaw, or on either of the Eildons, a single pebble, or gravel, or sand of any kind, indicative of the former presence of water. All were sharp angular pieces of the same rock as that of the hills respectively, to the exclusion of all foreign material. Now, if the water remained long enough at any single level to have left manifest and permanent indentations upon the hard ridges, it must have had ample time to convert the loose angular fragments which

* In a little quarry above the road, at the foot of these inclined hollows, the hard greywacke is divided in different directions by a system of joints, one set of which inclines from 6 to 8 degrees to W.S.W., coinciding with the dip and direction of the hollows. This made me think at first that their surfaces might have been modelled by these joints; but they are too uniform and continuous, and other appearances do not support this view. In another adjoining quarry the dip is 80 N.N.W., with a W.S.W. and E.N.E. strike, which nearly coincides with that of the inclined hollows. This can only be seen in one spot, where a few thin beds of soft shale intervene, the bulk of the rock being a coarse greywacke without bedding or cleavage, but with strong joints, and assuming here and there a rude columnar structure.

would be ground against each other by every tide, into smooth pebbles and shingle. Nor is it easy to conceive how terraces of 100 or 120 yards broad, as on the Eildons, formed of angular stones detached and precipitated from above, could have been made to assume by the action of water, even the irregular horizontality they do actually possess, when falling upon a slope having an angle of thirty or forty degrees; and this, without the stones showing any marks of attrition. On a gently inclined beach, where the tidal wave is ever and anon rolling such fragments over a considerable area, they would soon be converted into rounded pebbles; but on a steep rocky shore they would fall at once into deep water and assume the shape of a conical talus or "scree," where the tide would have comparatively little effect upon them. Their rough angular surfaces would lock into each other, and prevent them from being scattered over so broad a space as we see them on the Middle Eildon. It must also be borne in mind, in reference to the terraces on the eastern hill, which appear to have slipped down from their original situation, that the probability of their having done so is much weakened by their being composed of angular stones.

It struck me as singular, that all the terraces I examined, should be found on the sides of the respective hills most exposed to the strong currents that may be assumed to have been then in action; those on the north side of the Eildons, facing the great valley of the Tweed; those on Williamlaw, overhanging the more circuitous one of Gala water. Of course I conclude they do exist on the retired sides of some of the hills. One should have supposed, *à priori*, that the currents would have swept away the fragments of rock as they fell from above, and would have prevented them from accumulating into projecting shelves. Indeed, several of the best developed are *widest* precisely at the point where they project into the valley, and would come in contact with the current. I was also surprised to find no trace of terraces in other situations, apparently more favourable to their production. Immediately to the west of Williamlaw, and seen to advantage from its summit, is a wide and deep circular amphitheatre, formed by the smooth grassy sides of several neighbouring hills which environ it with very uniform slopes, except on the side that connects it with the valley of the Gala water. If the sea ever occupied the latter, it must also have filled this hollow, and converted it into a spacious, though sheltered and tranquil bay, round whose encircling sides, well-developed terraces might be expected to be found. Their total absence, therefore, from so favourable a locality, leaves room to inquire whether those which occur in more equi-

vocal situations do really indicate the lines of ancient beaches.

On the north or highest of the two points of Williamlaw, and near the summit, are two broad indistinct terraces, whose surfaces slope considerably towards the southern or lowest point, and also to the west. The crest between the two points is a succession of low eminences and intermediate furrows, which have no connexion with any of the terraces, but are formed of the basset edges of the harder beds. As the dip and strike of these correspond in the main with those of the slanting ridges below, and as they are separated by similar smooth grassy hollows, there can be no doubt but the cause assigned by Mr. Kemp for the latter, is the true one.

At the south foot of Williamlaw, on the opposite bank of the Gala, is a broad level grassy plain, formed of diluvium at the time the whole valley was under water, and subsequently cut through by the existing stream. It reminded me strongly of the true terraces near the head of Glen Roy.

Having now stated, as clearly as I can, the observations that occurred to me on a hasty view of these terraces, I have only to express a hope that more competent geologists may be induced to examine them in greater detail. Whether the theory proposed by Mr. Kemp be the true one or not, the merit of having first discovered, and then worked them out with such ability and perseverance, will ever be his own. No one will rejoice more than myself to see my objections answered, and a cause assigned that shall explain the difficulties and harmonize with all existing appearances. Nor is this all; the complete explanation of any set of natural phænomena, lessens the difficulty of comprehending others, still obscure, to which they are allied; and is another step in advance towards the future solution of the grand problem, the aggregate causes that have produced the existing state of things upon our globe.

J. E. Bowman.

Manchester, October 10, 1840.

BIBLIOGRAPHICAL NOTICES.

The Flora of Yorkshire. By Henry Baines, Sub-curator to the Yorkshire Philosophical Society. 8vo. pp. 160. London, Longman and Co.; Leyland and Son, Halifax.

We have here a very interesting work—the Flora of an important district, carefully investigated by an industrious and intelligent practical botanist, who has been enabled, by peculiar circumstances, to combine with his own the valuable labours of others to a very unusual extent. A preliminary essay, by Professor Phillips, on the Physical Geography of Yorkshire, in relation to the distribution of

plants, adds much to the value of the book. Mr. Baines's list of species, and of the stations of the rarer ones, is no doubt still imperfect; but its publication, such as it is, will be a great help to the cultivators of botany within the district, and not less important to those in other parts who want to know where the rarer species may be procured, or who study the geographical distribution of plants over the country, and the connexion of particular species with particular rocks, soils, or local circumstances.

On these points the information given is no doubt accurate; but conclusions drawn from the mere circumstance of species not having been noticed in particular districts are seldom to be relied upon until the statements have been some time before the public without being called in question. For example, *Rosa rubiginosa* is quoted by Professor Phillips in the introductory essay as confined in Yorkshire to the north-eastern or oolitic hills, but a supplement to the work returns it as occurring at Conisbro' in the south-western district, and we have ourselves found it truly wild within a few miles of York, in the great central vale. Speaking of this latter district, Professor Phillips remarks, "that receiving from numerous streams the detritus of the uplands lying east and west, the vale of York is full of plants which seem derived from these districts, as well as others more commonly found in lower ground. Its flora is consequently very rich, and plants supposed to characterize different soils grow here near together." It is, indeed, very striking to see in low moist fields over this plain plants usually stated to be peculiar to limestone or chalk, and to see them here attaining a magnitude and luxuriance, which they seldom approach in their more appropriate stations; but the soil will be found everywhere to abound with lime, so that the fact confirms the opinion (could it be supposed to need any confirmation) that certain plants require the presence of this substance for their healthful growth. *Campanula glomerata*, *Orchis ustulata*, which attains to remarkable size and beauty, and *Poterium Sanguisorba*, here growing abundantly in moist fields subject to frequent overflows, (though only mentioned by Mr. Baines as appearing on limestone rocks and the chalk wolds) are instances of proper limestone plants which abound in this district.

When Professor Phillips speaks in his essay of *Dryas octopetala* as peculiar to Yorkshire, he, of course, means in England, which should have been expressed, as most floras include plants of Scotland and Ireland, and the *Dryas* occurs in both countries. Even with respect to England, the statement is not strictly accurate, as Mr. Harriman found it in Durham.

Arabis hispida (*petræa* of DeCandolle) can only be said to be peculiar to Yorkshire, speaking of England, exclusively of Wales as well as Scotland, and *Juncus polycephalus* belongs to the highlands of Scotland. The presence of these plants shows that Yorkshire has a more alpine character than any other district of England, not even excepting the Cumberland and Westmoreland mountains.

Among the plants which attain their southern limit in Yorkshire is mentioned *Saxifraga umbrosa*. This plant, in fact, is hardly found in England, except in Yorkshire; but it is not a northern plant, the

Scotch stations, near Edinburgh and Glasgow, being suspected by Sir W. Hooker to be escapes from cultivation; whilst the species is exceedingly abundant in the west and south-west of Ireland in as mild a climate as any part of the British Islands affords.

Among the plants added on the authority of Mr. Gibson of Hebdenbridge, we observe *Stipa pennata*, the feather-grass, said to be found on Rumbald's Moor. We are not aware that this plant has been found wild in Britain, since its alleged discovery in Long Sleadale, Westmoreland, by Dr. Richardson, published by Dillenius; and as nobody has met with it since, though it is so remarkable and conspicuous, either in the station given or elsewhere (and we have ourselves, like many other botanists, searched Long Sleadale with great care expressly with this object in view), it has generally been concluded that Dr. Richardson fell into a mistake. The present discovery is very interesting, if liable to no doubt, but it requires to be supported by good evidence. Not inferior to this in interest is the addition of *Cinclidium Stygium*, a moss previously known as a native of the north of Europe and America, and very lately announced as British, which here, we believe, for the first time takes its place in a native flora.

Mr. Baines has arranged the plants according to the Natural Order, adding an alphabetical and a Linnæan index. The stations given of the rarer species are often very numerous, and with the assistance of Professor Phillips's admirable sketch of the physical geography of Yorkshire, will furnish interesting data to inquirers into the distribution of our flora. Remarks are often added respecting the insects that feed on particular plants.

On the whole, the volume, which is very neatly printed by Mr. Leyland of Halifax, himself well known as an intelligent and zealous naturalist, and furnished with two illustrative maps, will be found a useful and pleasing addition to the Botanical library, and does much credit to the worthy author, in whose diligence, accuracy, and fidelity all who know him will confide.

A Flora of Shropshire. By W. A. Leighton, Esq., B.A., &c. 1 vol. 8vo. 1840. Shrewsbury.

We look upon the appearance of this work (which is now completed by the publication of the 3rd part) as being a great step in advance in the progress of British indigenous botany; for although it is professedly confined to the description of the plants of a single county, yet as clearly showing the incorrectness of the idea "that a *new* Flora in the true sense of the term has become impossible," it is indispensable to every botanist who desires to obtain a thorough knowledge of our native plants. Since the publication of the 'English Flora' no work has appeared in which all the species are carefully and originally described; nor does any British book exist in which the descriptions are sufficiently detailed for the present wants of systematic botany; for in this latter respect, the celebrated work of Sir J. E. Smith is (from the date of its publication) necessarily deficient.

In the work before us, Mr. Leighton has accurately, and in most cases very fully, described the plants of his county; and from having used several of the continental Floras, in conjunction with that of Smith, he has in numerous cases introduced the description of parts which that excellent author has overlooked: we would particularly mention the seeds, a minute attention to which was not requisite when botanists almost entirely confined themselves to the elucidation of the Linnæan system alone, but which are now considered of great value in determining the natural affinities of plants, as well as in certain tribes affording excellent specific characters.

The book under our notice is arranged according to the Linnæan system, but care appears to have been taken that the generic and specific characters should be such as will serve for any classification. In some of the more difficult genera outline sketches are given of those parts from which the characters have been derived, and these, although deficient in artistical beauty, are deserving of the highest praise for clearness and accuracy of detail: they include a complete series of drawings for the *Cyperaceæ*, *Potamogeton*, *Valerianella*, *Rumex*, &c.

In looking through the volume, we observe that the account of the *Cyperaceæ* is so full as almost to constitute a monograph of the British species; *Viola* is very fully illustrated by new observations; *Chenopodium acutifolium* and *polyspermum* are proved to form only one species. In the genus *Rubus*, we have a series of very valuable observations from the pens of Nees ab Essenbech, Borrer, and Lindley, causing the introduction of the names of several new forms (we will not venture to call them species) into the British lists; in the genus *Carex* valuable characters, illustrated by a complete series of figures, have been drawn from the form of the ripe nut; and as the author's observations are manifestly original, he is no doubt ignorant of (or perhaps been unable to obtain) the rare work of Schkuhr upon this genus, in which a similar, though to our mind, less satisfactory series of figures of nuts is given. The species of oak are illustrated by the valuable notes of Professors Graham and Don, three forms being distinguished; we must, however, confess, that our own opinion is against there being really more than one species in Britain, although three varieties may be easily pointed out. We are acquainted with no permanent character by which the oaks can be specifically distinguished from each other; for although in their extreme forms they abundantly differ, yet the intermediate forms, both in shape of leaf and length of peduncle, do not appear to allow of any marked line of separation being drawn.

The following plants appear for the first time as English plants in the present work:—

Atriplex deltoidea, *Bab.*
Ballotta ruderalis, *Fries.*
Callitriche platycarpa, *Kütz.*
Cardamine sylvatica, *Link.*
Cerasus austera, *Leight.*
Dianthus plumarius, *Linn.*
Myriophyllum alterniflorum, *DC.*
Quercus intermedia, *Don.*
Scrophularia Ehrharti, *Stev.*
Senecio erraticus, *Bert.*
Spergula vulgaris, *Bnng.*

In conclusion, we must observe, that the specific characters are often far longer than is desirable; that in making alterations in the nomenclature, the author has in some cases not sufficiently pointed out the reasons which have induced him to adopt different names from those employed by Smith and Hooker; we must, however, add, that in most instances we are acquainted with causes fully authorizing the change. A more frequent reference to foreign authors would also have added much to the value of the book.

We must again express a hope that this work will soon be in the hands of all British botanists.

Tijdschrift voor Natuurlijke Geschiedenis en Physiologie; edited by Professors Van der Hoeven and de Vriese; Vol. VI., Part IV. Leyden, 1839.

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PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

January 14, 1840.—William Yarrell, Esq., V.P., in the Chair.

Mr. Ogilby exhibited the skull of the Mangabay Monkey (*Cercopithecus Æthiops*, Auct.), and called the attention of the members present to the fact that this species, like the *C. fuliginosus*, differs from other Cercopitheci in possessing a fifth tubercle to the last molar of the lower jaw.

A variety of the common Hare (*Lepus timidus*, Auct.), shot in Sussex, and presented to the Society by Augustus E. Fuller, Esq.,

* [The *Bulla* here described is only a variety of *Bulla Velum*, which often has one, two, or three white bands.—J. E. GRAY.]

was exhibited: it differs chiefly in being of a smaller size, and in having the fur somewhat mottled with whitish and in parts rust colour.

Mr. Waterhouse exhibited a new species of Rodent from the river Gambia, constituting a most interesting link between the genera *Mus* and *Cricetus*: like the first of these genera, it has a long scaly tail, but it resembles the Hamsters in possessing large cheek-pouches. In the number of its molar teeth and the form of the skull it presents all the most common characters of the *Muridæ*, as defined by Mr. Waterhouse in the 'Magazine of Natural History*.'

The skull compared with that of the Common Rat (*Mus decumanus*, Auct.) differs chiefly in having the nasal portion more elongated: the anterior root of the zygoma, as in that animal, is in the form of a thin plate, but this plate is less extended in its antero-posterior direction, is directed obliquely outwards and upwards, and leaves a tolerably large and nearly round ant-orbital opening, thus differing from the Common Rat, in which the lower portion of this opening is in the form of a vertical slit: the zygomatic arch is less extended in the longitudinal direction, the incisive foramina are much smaller, and the auditory bullæ are rather smaller in proportion. The molar teeth are rooted; the foremost of these teeth in either jaw is the largest, and the posterior one the smallest: in the upper jaw, as in *Mus*, the molars present a central row of larger, and two lateral rows of smaller tubercles; and the molars of the lower jaw have two principal rows of tubercles; there are however some slight modifications in the structure of these teeth, which should be noticed. The front molar of the upper jaw has three central tubercles, three smaller ones on the outer side and two on the inner side, and besides these there is a small ninth tubercle on the posterior part of the tooth, which is not observed in the Black and Common Rats; the second molar has two small extra tubercles, one in front and one behind; the crown of this tooth therefore presents eight instead of six tubercles, as in *Mus* proper, and the last molar possesses one extra small tubercle, which is placed on the anterior and outer part of the tooth. The molars of the lower jaw very closely resemble those of *Mus decumanus*.

In the form of the lower jaw the present animal differs from that last mentioned, chiefly in the greater breadth of the descending ramus or angle, which is moreover somewhat raised, and so far approaches the Hamsters.

The name *Cricetomys* was proposed for this new subgenus, and that of *Gambianus* to distinguish the species, and to indicate the locality in which it was first discovered. The principal characters may be thus expressed:—

Subgenus ad genera *Cricetus* et *Mus* dicta affine, et inter hæc medium locum tenens. Criceto simile quoad saccos buccales, Muri simile quoad formam corporis et caudæ; hâc perlongâ et pilis brevibus vestitâ, inter quos squamæ in more annulorum positæ videntur. Pedes ut in Mure.

Dentes fere ut in Mure. Incisores compressi; molares radicati, $\frac{3-3}{3-3}$.

* Vol. iii. p. 275.

Cricetomys Gambianus. *Cri. magnitudine corporis duplo, vel plus, majore quàm in* Mure decumano: *colore ferè eodem: auribus mediocribus, pilis minutis vestitis; caudâ corpus cum capite æquante; pedibus mediocrè parvis; vellere brevi, adpresso, et subrigido; colore cinerescenti-fusco; pedibus partibusque inferioribus sordidè albis; caudâ ad basin, pilis intensè fuscis, ad apicem, albis, obsitâ.*

	unc.	lin.
Longitudo ab apice rostri ad caudæ basin	16	0
——————————— basin auris .	2	9
——— *tarsi digitorumque*	2	6
— *auris* .	0	11
— *caudæ*	15	0

The Gambia Pouched-Rat is about double the size of the common Rat (*Mus decumanus*); in its colouring and proportions it greatly resembles that animal; the fur is rather harsher, and more scanty: the general colour of the upper parts of the body is a trifle paler than in *Mus decumanus*. The head is tolerably long, and pointed; the ears are of moderate size and rounded form; the feet are of moderate size; the tail is nearly equal to the head and body in length, thick at the base, covered with small adpressed harsh hairs; but these are not sufficiently numerous to hide the scales; about one third of the tail at the base is of a deep brown colour, the hairs covering the remaining portion are pure white, and the skin itself has evidently been of a paler hue than on the basal part of the tail. The fur on the body is somewhat adpressed, and the hairs are glossy on the back; they are of an ashy-gray colour at the base; the apical half of each is brownish-yellow, but at the points many of them are brownish; many longer hairs intermixed with the ordinary fur of the back are almost entirely of a brownish-black colour. The whole of the under parts of the head and body and inner side of the limbs are white; the hairs on the belly are rather scanty, and of an uniform colour to the root: the fore feet are whitish, and the tarsi are white, but clouded with brown in the middle. The ears are but sparingly clothed with short hairs, which on the inner side are whitish, and on the outer brown.

January 14 and 28th, 1840.—William Yarrell, Esq., Vice-President, in the Chair.

Mr. Ogilby read his paper entitled 'A Monograph of the Hollow-horned Ruminants,' of which the following is an abstract:—

"In revising the history of the *Ruminantia*," says Mr. Ogilby, "the zoologist who, like myself, has made a special study of these animals, must be forcibly struck with the confusion of synonyms, the carelessness and inaccuracy of description, the vague and indefinite limits of the generic and subgeneric groups, the trivial and confessedly empirical principles of classification, and, as a consequence, the great number of nominal species, and the general disorder which still prevail in this department of Mammalogy." He proceeds to show that the views of the modern writers on this subject are no

more philosophical than those of their predecessors, and that as regards their generic distribution, the Ruminantia remain at present in very nearly the same state as that in which Ray left them a hundred and fifty years back.

The history of the classification of this group next comes under the consideration of the author, and the views of the various writers are given and commented upon, commencing with the publication of the 'Synopsis Methodica' of Ray, published in 1693. The genera *Ovinum*, *Bovinum*, and *Caprinum*, established by that author, Mr. Ogilby regards as strictly natural groups, but the characters by which they are distinguished, derived principally from the curvature of the horns, the existence of a beard or dewlap, the number of teats, and the woolly or hairy nature of the covering, he considers trivial, arbitrary, and uninfluential.

The 'Systema Naturæ' is next considered; and although arbitrary and empirical, the generic definitions of Linnæus (the author of the paper states,) possess all the logical correctness and simplicity which so peculiarly characterize the genius of that great man. Though neither natural nor scientific, his distribution was, at all events, exclusive and diagnostic, in reference to the small number of Ruminants then known. But whilst the zoology of the *Ruminantia* remained thus almost stationary in the hands of Linnæus, it was making rapid and brilliant progress under the auspices of his great rival and cotemporary, Buffon: even as early as the year 1764, two years before the publication of the 12th edition of the 'Systema Naturæ,' the French philosopher had described new forms, and indicated important relations among the hollow-horned Ruminants. The article 'Gazelles,' contained in the 12th volume of his great work, was the most important addition which had been made to the generic distribution of the Ruminants since the time of Ray, and must be considered as the first monograph of the genus two years afterwards founded upon it, and more formally proposed by Pallas under the name of *Antilope*.

The works of Pallas, Pennant, Allaman, Gmelin, Erxleben, Shaw, Illiger, Lichtenstein, De Blainville, and Col. Hamilton Smith, next pass under the notice of the author.

The consideration of the muzzle and lachrymal sinus was first introduced by Illiger, and his principles were quickly adopted, in successive monographs by Lichtenstein, De Blainville, and Hamilton Smith, to subdivide the Antelopes into something more nearly approaching natural groups than the old principles admitted. The publication of Illiger's 'Prodromus' may be considered therefore as an epoch in the history of these animals.

The monograph of Dr. Lichtenstein contains descriptions of twenty-nine species, and these are distributed into four groups, characterized by the presence or absence of horns in the females, and of lachrymal sinuses, the existence or non-existence of dewlap, and the comparative length of the tail. But the author was in many cases ignorant of the specific characters of the animals, and the composition of his groups is consequently faulty in proportion. The di-

visions, however, are exceedingly well imagined, and less encumbered with trivial characters than those of De Blainville and Hamilton Smith.

M. De Blainville, whose monograph of the genus *Antilope* was published in 1816, contented himself with separating from the main group successive detachments of what he conceives to be the most anomalous species, afterwards elaborating the characters of the subgenera thus formed from those of their component species. By this means he has unquestionably succeeded in forming a few natural groups, to which no other objection can be made than that they are considered as subdivisions of a primary group which is not itself a natural genus.

To the eight genera established by De Blainville, Desmarest added three others, two of which, viz. the separation of the Antelopes proper from the Koodoo and Boshbok, and of the Oryxes, were decided improvements.

The principal merit of Col. Hamilton Smith's monograph, published in Griffith's translation of the 'Règne Animal,' consists in the resolution of the residual group of De Blainville and Desmarest, which he subdivides into eight minor groups, in all respects more definite and natural than the original.

The next section of the paper is devoted to the consideration of the characters hitherto employed in the generic distribution of these animals.

The genera *Bos*, *Ovis*, and *Capra*, represented by familiar and well-known types, observes Mr. Ogilby, carried with them clear and definite ideas, and represented to the mind of the naturalist distinct and determined forms; but the genus *Antilope* not being exemplified by any common domestic species familiar to the observation of the student, every thing connected with the genus was vague and indeterminate; the only conception it enabled him to form was, that the animal, whatever else it might be, was neither an ox, a sheep, nor a goat. The characters, moreover, upon which this genus is established, are in reality so many negative traits, and merely served to distinguish all other hollow-horned Ruminants from the oxen, sheep, and the goats respectively, but they limit no positive group, and consequently cannot be received as the definition of a natural genus. The genus *Antilope* in a short time became an asylum for the reception of all hollow-horned Ruminants that could not be associated with the known genera *Bos*, *Ovis*, and *Capra*; and consequently the most incongruous forms and opposite characters were associated in the same genus; till, independently of its unphilosophical structure, and total want of character whether natural or artificial, the practical inconvenience arising from its undue extension forced zoologists to devise the partial remedies detailed above, and which all proceeded upon one common principle, that, namely, of dividing the genus *Antilope* into such subordinate groups as were conceived best calculated to obviate the inconsistencies, and approximate those species which most nearly resembled one another in habit and conformation. In thus subdividing the genus *An-*

tilope it is assumed by every writer on the subject to be a natural group, even whilst they confess that it has not a single character either exclusively appropriate to it or even common to the generality of its component species: far, therefore, from being a natural, it is not even entitled to be considered an artificial group. The diagnosis proposed by M. Geoffroy St. Hilaire regarding the nature of the core of the horns, and that broached at a meeting of the Zoological Society by M. Agassiz, to the effect that these animals are distinguished from *Bos*, *Ovis*, and *Capra*, by having a spiral twist of the horns turning from left to right, instead of the opposite direction, are founded upon hasty generalizations, inapplicable to at least three-fourths of the species.

The form or curvature of the horns, the beard, the dewlap, the scopæ, the number of teats, and other such diagnoses hitherto employed to define the genera of Ruminants, according to the views of Mr. Ogilby, are purely trivial and accidental characters, which not only exercise no assignable influence on the habits or economy of the animals, but which may be modified to any extent, or even destroyed altogether, without in the slightest degree changing the generic relations.

Having demonstrated the imperfections of the actual distribution of hollow-horned Ruminants, Mr. Ogilby proceeds to the exposition of the principles which he proposes to make use of for that purpose, and to explain the nature and extent of his own researches. He insists upon the law of classification, that no generic characters should be admitted but such as are founded upon the necessary relations that subsist between the organic structure of animals and their habits and economy.

The next section of the monograph is devoted to the consideration of the horns of the *Ruminantia*. Under this head the author first treats of their substance; 2ndly, their permanent or deciduous character; 3rdly, their presence or absence in different genera and sexes; and 4thly, their number, forms, and flexures.

The distinctions between the horns of the stag tribe generally, and those of the hollow-horned Ruminants, are pointed out, and in the next place the various modifications observable in the horns and their core of the latter group. "In some cases the substance of this bony core is solid, or at least penetrated only by minute pores; in others, and they are by far the greater number, it is partially hollow, or filled with large cancelli, which communicate with the frontal sinuses. These variations are not confined to any particular groups, but are equally common to solid and hollow-horned genera. The giraffe, for instance, has very extensive cancelli; so likewise have the oxen, sheep, goats, and all the larger species hitherto classed among the antelopes: nor have I found the solid core, so much insisted on by MM. Cuvier and Geoffroy St. Hilaire, in any of these animals, except the *A. Cervicapra*, the *Dorcas*, and their allied species."

Speaking of the raised ridges and annuli on the horns, Mr. Ogilby states that the number of these added in a given time appears to be

very variable. "The common cow is generally supposed to acquire one ring on the horn every year after the third, but this is far from being a general law. Between the 20th of July and the 31st of October, 1833, the horns of a young Indian Antelope (*A. Cervicapra*), which I had marked for the purpose in the gardens of the Society, acquired an addition of no fewer than three rings, and an increase of length of a full inch and a half; and I have observed a similar phænomenon in other species."

The permanent or deciduous character of the horns is said to depend upon their hollowness or solidity; and the author, moreover, states that it is not correct to suppose that hollow horns are, strictly speaking, permanent; the hollow horn is shed, as well as the solid, but in a different sense. "Buffon has been much ridiculed for asserting this fact with regard to the domestic ox, but Buffon was a much better observer than his critics: and I have myself verified his observations on many other Ruminants. If the horns of any young animal be examined, it will be found that they are of a coarse, scabrous, spongy texture, very thick and blunt in proportion to their length, and hollow nearly to the point: let the same individual be examined when it arrives at maturity; the horns, especially towards the extremity, have a close, compact, and polished surface; they are much attenuated, end in a very fine point, and have the terminal third perfectly solid. These changes do not arise from the mere rubbing and polishing of the horn, as is commonly supposed. That hypothesis does not account for the difference of texture and solidity which distinguish the old and young horns; but the truth is that, as in the case of the second dentition, the permanent organ is developed under, or rather within the other, and by its growth gradually carries it upwards, and supports it like a sheath or scabbard. The young horn thus severed from the vessels which formerly supplied it with nutriment, dries up, bursts from the expansion of the permanent horn within it, and exfoliates in large irregular stripes, leaving the latter with the finely polished surface, and solid, sharp, attenuated points which distinguish them. As far as my observations enable me to judge, this exfoliation takes place only once during the life of the animal, and that at the period of adolescence, immediately before the appearance of the first annulus. Though it does not take place all at once, nor absolutely deprive the animal of horns for a certain period, it is nevertheless a true and actual shedding of these organs, and accounts satisfactorily for many phænomena which I found inexplicable before making these observations. The horns of the Oryxes, for instance, which in the adult state are remarkable for their straightness and extreme sharpness, have the points very blunt, and bent backwards, almost at a right angle, in the young animal; and the Koba, or Sing-Sing, whose permanent horns are partially lyrated, has the young organs nearly straight, as may be observed in the specimen now in the Society's museum. It is only necessary to observe further, that the young horn, which afterwards exfoliates, appears to be entirely the growth of the first year, though it generally remains a much longer time before being cast. A young *Leu-*

coryx in the museum at Frankfort, with horns eighteen or twenty inches long, has the points still blunt, exactly as in another specimen, where they are only two inches long." "Now this permanence or deciduousness of the horns—for in a general sense, and especially as contrasted with the solid organs of the deer kind, the hollow horn may be considered as permanent—is a constant and invariable character, which has a direct and powerful influence upon the habits and œconomy of the animals. The deer kind invariably affect particular localities at the period of casting and renewing their horns; their manners then undergo a complete change; from bold and daring, they become irresolute; they lose their flesh, abandon the open hills and upland plains for the thick cover of the forests, and foregoing their gregarious habits, desert their companions, and pass the period of weakness in solitude and seclusion. As soon, however, as the new horn acquires strength and solidity, the stag resumes his usual habits, and regains his former confidence. Hollow-horned Ruminants present no such phænomena; the habits and manners of the same species are similar at all seasons, and the differences which we observe in different species depend upon other causes, which shall be developed in the sequel. The modifications of organic structure which produce these different effects are too permanent and influential to be neglected among the characters of a natural classification of the Ruminants. Nor have they been overlooked by zoologists; it may be said, indeed, with truth, that they constitute the only really important characters hitherto employed to distinguish the genera of these animals."

The presence or absence of horns in species or sexes has been partially employed by naturalists for the distinction of genera; the importance of this character, however, in the opinion of the author, has not been duly appreciated. Its effects on the habits and œconomy of the species of Ruminants is pointed out. The gentleness and timidity of those species which have hornless females, their being either perfectly monogamous, or residing in small detached families, composed of a single adult male and variable number of females, and the circumstance of the males adhering throughout life to the same female, are all phænomena which are traceable to the defenceless condition of the females. These phænomena are contrasted with those exhibited by Ruminants, in which there are horns in both sexes; they are said to be extremely bold, to reside generally in large herds, and to have a community of sexual intercourse, and rarely attach themselves to particular individuals.

The number, form, and peculiar curvatures of the horns are next considered; and the author arrives at the conclusion, that all the various flexures of the horns, as well as their number, form, and direction, have no assignable relation to the habits and œconomy of animal life; they should not therefore be selected for generic diagnoses. On the other hand, the form of the upper lip, as well as its hairy or naked character, having a very decided influence on the habits and œconomy of ruminating animals, ought by no means to be neglected in the classification of this group. Other important characters may

be derived from the crumens and other glands, or certain pits or sinuses which open externally, especially in different parts of the head in ruminating animals. The most remarkable, as well as the most common of these are the suborbital, sometimes called the lachrymal sinuses, or tear-pits, but which Mr. Ogilby distinguishes by the name of *crumens*, a term applied to them by Dr. Flemming. These are situated at a short distance below the inner canthus of the eye, and received into a cavity of the lachrymal bone: at their bottom is a gland, opening into the crumen by a number of small apertures, and secreting a viscous substance, of the consistence of ear-wax. The various modifications of the form of these crumens in different Ruminants being pointed out in the paper, the author proceeds to the consideration of their functions and uses: he observed that the Gazelles and Antelopes in the Society's menagerie frequently protruded this crumen, and rubbed its inner surface against the rails of the compartments in which they were confined, seeming to take a pleasure in smelling and licking it afterwards. A male and female Gazelle, occupying contiguous compartments, were changed, and it was found that they immediately discovered the viscous deposit and became restless and agitated; the male Gazelle was some days after made to change places with an Indian Antelope, but neither animal appeared to take the slightest notice, or to be aware of the presence of its predecessor. "This, to be sure," says Mr. Ogilby, "is but a single experiment, but it countenances the idea, highly probable in itself, that the deposit which the animals leave behind them by rubbing the crumens against the shrubs or stones of their desert and mountain habitats, (for it is only the inhabitants of such localities that are furnished with these organs, at least among the hollow-horned family,) may serve to direct them in their wanderings and migrations, when the storms and fogs incident to such places obscure all visible landmarks. But whatever it may be, the principles of sound philosophy and the great doctrine of design forbid us to entertain the notion that so markable an organ has been formed without some special and appropriate function in animal œconomy."

A superficial slit, situated in a depression of the maxillary bone, on either side, called by the author the maxillary sinus, is found in certain Ruminants hitherto classed among the Antelopes; its secretion is of a thin watery consistence, and thus differs from the secretion of the crumens. The situation of these glands, and their peculiar secretion, induces the author to regard them as distinct organs, and he doubts their coexistence with the crumens, though M. F. Cuvier and Colonel Smith have reported such sometimes to be the case.

The membranous sac which opens behind the ear of the *Chamois*, and the large gland which Mr. Hodgson describes in the nose of the *Chiru*, are of too partial occurrence to be made available in generic characters; there are, however, two large and deep sacs, situated one on each side of the udder, which are of pretty general occurrence, but their function does not appear to exercise sufficient influence over the animal œconomy to entitle them to be considered among the

generic characters. "The same observation may be applied to the odoriferous bags attached to the prepuce of the *Musk* and *Antilope guttarosa*; so that, upon the whole, the crumens, maxillary and facial glands, are the only organs of this nature which appear entitled to the rank of generic characters."

The modifications of the feet are considered as scarcely definite enough to be employed for generic definitions: "the glands or pores which open between the toes of many Ruminants afford much better characters for this purpose, and bear a very evident relation to the habits and geographical distribution of the animals. These glands are of greater or lesser extent in different genera, according to the nature of the localities which they frequent; in the *Gazelles*, *Antelopes*, *Bubals*, and *Oryxes*, which inhabit the burning deserts of Africa and central Asia, they are extremely large, and frequently occupy the whole interspace between the first and second phalanges in the *Sheep*, *Capricorns*, and *Tragelaphs* again, which live on the open grassy downs and mountains of a less arid nature, they are of a much smaller size; whilst in the *Oxen*, *Calliopes*, &c., which inhabit the moist forests and swamps of tropical regions, or grassy meadows of temperate climates, they are altogether wanting.

After describing the uses of these digital pores, and pointing out the great influence they have on the œconomy and manners of the animals, the author observes that he is not aware of their having been noticed by any previous zoologists, and concludes by expressing the hope that the employment of this and other influential characters, which it is the object of this first part of his monograph to explain, will be found to establish a logical, scientific, and natural arrangement among the *Ruminantia*, instead of the prevailing arbitrary and artificial system

LINNEAN SOCIETY.

April 7th.—Mr. Forster, V.P., in the Chair.

Dr. Farre, F.L.S., exhibited specimens of a singular form of gall on the leaves of a species of oak from Mexico. The gall consisted of an aggregation of hollow cylindrical tubes, nearly an inch in length, and furnished with a fringed orifice. The tubes were remarkable for their elegance and uniformity; their colour was white, suffused with red, especially towards the apex.

Mr. Yarrell, F.L.S., exhibited a specimen of a satin-like mass of *Conferva fluviatilis*, which grew in a water meadow near Totness. A spring, which flows only in winter, rises in the meadow, and this substance is taken from narrow gutters, from one of which, twelve inches wide, a piece was taken up which measured seventy-nine feet in length, so firm and tough was its consistence; and another piece broke off at thirty-nine feet. In consistence and appearance it bore considerable resemblance to a piece of cotton wadding, but of a firmer texture. A portion was carefully examined under the microscope, and found to consist entirely of an interwoven mass of filaments of *Conferva fluviatilis*. The plant was compared with the authentic

specimen of that species preserved in the Linnæan Herbarium, and was seen to differ only in the greater length of the articulations. The under surface of the mass was of a bright green colour, but the upper surface was white from the effects of direct exposure to the air and light, which had caused the death of the plant at that part.

Read, a continuation of Mr. Smith's "Arrangement of the Genera of Ferns."

April 21.—The Lord Bishop of Norwich, President, in the Chair.

Read, a paper by John Blackwall, Esq., F.L.S., entitled "The Difference in the Number of Eyes with which Spiders are provided, proposed as the Basis of their distribution into Tribes; with the characters of a new Family and three new Genera of Spiders."

Mr. Blackwall begins by stating his objections to the bases of arrangement adopted by MM. Walckenaer and Dufour in the subdivision of the order *Aranéides*, and proceeds to give his reasons for preferring a division founded on the number of eyes: in conformity with which he proposes three tribes, viz. 1. *Octonoculata*; 2. *Senoculina*; 3. *Binoculinæ*.

In the first tribe he proposes three new genera, two of them belonging to a family which he characterizes under the name of *Cinifloridæ*: these genera he also characterizes under the names of *Cinifla*, founded on the *Clubiona atrox* of Latreille, and *Operaria*, comprising the *Theridion berigunne*, Walck., *Drassus exiguus*, Blackw., and *Drassus viridissimus*, Walck. The third genus characterized by Mr. Blackwall, is referred by him to the family of *Agelenidæ*, under the name of *Curator*: it is founded on the *Clubiona saxatilis*, Blackw.

May 5.—The Lord Bishop of Norwich, President, in the Chair.

Read, "Additional Observations on some Plants allied to the natural order Burmanniaceæ." By John Miers, Esq., F.L.S.

These observations have reference chiefly to the relative position of the parts of the flower in the tribe of plants above-mentioned. The author remarks, that the stamina, placentæ, and stigmata in these plants, are disposed in the same line, and opposite the inner series of the perianthium. The placentæ are always invariably double; and the stigmata in such cases as the present are to be regarded as being made up of the confluent margins of the two adjoining carpel-leaves, as suggested by Mr. Brown in his learned Memoir on *Cyrtandreæ* lately published.

May 25.—The Lord Bishop of Norwich, President, in the Chair.

This day, the Anniversary of the birth-day of Linnæus, and that appointed in the Charter for the election of Council and Officers; the President opened the business of the meeting, and in stating the number of Members whom the Society had lost during the past year, gave the following notices of some of them:—

George, Duke of Marlborough, one of the Honorary Members, was distinguished for his botanical taste, and for his zeal in the cultivation of exotic plants; and the magnificent collection formed by him at White Knights was long one of the finest in this country, both in

regard to its extent, and the rarity and beauty of the specimens. His taste for Botany continued unabated to the last, and the collection established afterwards at Blenheim was chiefly cultivated under his own immediate superintendence.

John Bartlet, Esq.

John, Duke of Bedford, K.G.—This amiable and accomplished nobleman was a most munificent patron of the arts and sciences in general, and especially of Botany, in the cultivation of which he took great delight. We are indebted to him for several splendidly illustrated works, abounding in valuable practical remarks, on particular tribes of plants, of which he had formed extensive collections at his magnificent seat of Woburn Abbey.

William Beetham, Esq.

William Christy, Jun., Esq.—Few persons cultivated Botany and Entomology with more ardour than Mr. Christy, who, to the regret of his friends, and to the loss of science, was cut off at an early age. His zeal and success in the pursuit of science were only equalled by his readiness and liberality to impart to others a portion of the stores which he had collected. He had formed an extensive Herbarium of British and Foreign Plants, and for that purpose had made several extensive tours in the British Isles, and had also visited Madeira and Norway. His collection of dried plants, and books on Botany, he gave to the Botanical Society of Edinburgh, of which he was one of the institutors.

Lord Charles Spencer Churchill.

Richard Cotton, Esq.

Allan Cunningham, Esq.—This eminent botanist and traveller was born in the beginning of the year 1791, at Wimbledon, where his father (who was a native of Ayrshire) held the situation of gardener. His father took great pains with his education, and placed him, along with his younger brother, Richard, at an excellent academy at Putney, then conducted by the Rev. Mr. Adams. About the year 1808 both brothers were engaged in the office of the Royal Botanic Gardens at Kew, at the period when the second edition of the '*Hortus Kewensis*' was passing through the press. In the autumn of 1814, having been appointed a Botanical Collector for the Royal Gardens, he left England, in company with Mr. James Bowie (who had also received a similar appointment), for the Brazils, where they remained two years, and among many other plants transmitted by them, were *Gloxinia speciosa*, *Cereus speciosissimus*, *Jacaranda mimosifolia*, and *Calathea zebrina*, then new to the Gardens. The two companions now separated, Mr. Bowie having received instructions to proceed to the Cape of Good Hope, and Mr. Cunningham to New South Wales, where he arrived in 1817, and shortly after joined the expedition into the interior of that colony, under Mr. Oxley, the Surveyor-General. On his return to Sydney he embarked as botanist in the voyage of survey under the command of Lieutenant, now Captain Philip Parker King, of the Royal Navy. The survey continued four years, and during that period they circumnavigated Australia several times, and visited Van Diemen'

Land, Timor, and the Mauritius, at all of which places Mr. Cunningham formed extensive collections. After the conclusion of these voyages, Mr. Cunningham made several journeys into the interior of New South Wales, and subsequently visited Norfolk Island and New Zealand, where he remained several months. The fruits of his researches in the latter country are given in the 'Companion to the Botanical Magazine,' and 'Annals of Natural History.' After an absence of seventeen years, Mr. Cunningham returned to his native country, and continued to reside in the vicinity of Kew, until the melancholy tidings arrived of the death of his brother Richard, whom he was appointed to succeed in the quality of Colonial Botanist in New South Wales, where he again arrived in February 1837. In the following year he revisited New Zealand, and remained there during the whole of the rainy season, which produced serious effects upon a constitution already greatly debilitated, and on his return to Sydney his health visibly declined until the period of his death, which took place on the 27th of June last, at the age of 48. He was distinguished for his moral worth, singleness of heart, and enthusiastic zeal in the pursuit of science.

Davies Gilbert, Esq., F.R.S.—Mr. Davies Gilbert was distinguished by his high attainments in science and literature, his simple and gentle manners, and his amiable purity of heart. He was the son of the Rev. Edward Giddy, and was born on the 6th of March, 1767, at St. Erth, in Cornwall.

Davies Giddy was a child of early intellectual promise, but his health was feeble, and he received not only the rudiments but almost the whole of his education under the paternal roof, guided and assisted by a father whose classical learning was of a high order. For about a twelvemonth he was placed under the tuition of the Rev. James Parken, Master of the Grammar School at Penzance, to which town his family removed for that purpose; but he soon returned to Tredrea, which was long afterwards his favourite abode, to pursue his studies in a manner more congenial to his feelings. He had by this time formed a taste for mathematical investigations, in which he was aided by the knowledge, freely and kindly imparted, of the Rev. Malachi Hitchins of St. Hilary, a man whose name is well known and respected by practical astronomers. In the year 1782 he removed with his family to Bristol, and continued to cultivate the severer sciences with undiminished ardour. On the 12th of April, 1785, he entered as a Gentleman Commoner of Pembroke College in the University of Oxford, and soon attracted the notice of many of its Professors and Senior Residents. He resided pretty constantly there from his matriculation, except during the long vacations, till the year 1789, when he became an Honorary Master of Arts, but still continued to make long visits to his old College.

In November, 1791, he became a Fellow of the Royal Society, and formed a connexion with Dr. Maskelyne, Sir Joseph Banks, Mr. Cavendish, and other eminent members of that body, which terminated only with their lives. Though the sciences dependent on and connected with mathematics were the chief objects of his

early studies, he was far from inattentive to the claims of Natural History on a portion of his leisure. He cultivated chiefly that branch of it which embraces the vegetable kingdom; and an acquaintance formed in Cornwall with Dr. Withering, as well as his friendship with Dr. Beddoes and Dr. Sibthorp at Oxford, contributed to the same end. He became a Fellow of the Linnæan Society in 1792, in which year he also served the office of Sheriff for his native county. In the year 1804 he was chosen one of the representatives of the borough of Helston, and in 1806 was returned in a new Parliament for that of Bodmin. In this seat he continued till the year 1832, when he ceased to be a member of the legislature. During the whole time of his continuance in Parliament, he was the encourager and indefatigable supporter of every measure connected with the advancement of science; and by his representations and exertions many services were rendered to various scientific societies and institutions, in promoting whose prosperity and usefulness he was incessantly and zealously occupied. He took a prominent part in the inquiry relating to the currency, and published in 1811 a plain statement of the bullion question; and he was also very active both in the House of Commons and out of it in the arrangement of the standard of weights and measures.

In 1806 he married Mary Anne Gilbert, and in 1817 he assumed the name of her family, in pursuance of the injunction contained in a will of her uncle, Charles Gilbert, Esq., of Eastbourne, in Sussex. By this marriage he had seven children, of whom only four survived him; John Davies Gilbert, Esq., the present Sheriff of Sussex, and three daughters.

He became a Fellow of the Society of Antiquaries in 1820, and was likewise Fellow of the Astronomical and Geological Societies. He continued to perform the office of Treasurer of the Royal Society, till in 1827 he became President of that distinguished body. In the year 1831 he retired from the chair, and was succeeded by His Royal Highness the Duke of Sussex. In 1832 he received from the University of Oxford the Degree of Doctor of Laws, by Diploma.

His last visit to his native county took place in 1839. On leaving Cornwall he came through Exeter and Oxford to London, and returned after a few days to Oxford. This last journey, which was attended by some untoward circumstances, was too much for his sinking strength. On his return to London he fell into a state of lethargy, from which, though he was enabled to reach his home, he never fully recovered, but after lingering in this state for some time he expired, on the 24th of December, 1839, and in the 73rd year of his age.

The Rev. Joseph Goodall, D.D., Provost of Eton College.—Dr. Goodall was ardently devoted to the study of Natural History, but more especially to Conchology, with which science he was thoroughly acquainted, and his collection in that department was regarded as one of the most valuable in this country. He was ever a warm and zealous friend of this Society.

The Reverend Patrick Keith.—Mr. Keith long and successfully

cultivated the interesting department of Vegetable Physiology, to which he published an Introduction in 1816, under the title of 'System of Physiological Botany,' in two volumes, 8vo. The work contained the fullest and best account of the subject at that time in the English language, and was, moreover, enriched by numerous original remarks. Mr. Keith was likewise the author of a Botanical Lexicon, published in 1837, and three separate Memoirs, printed in the 11th, 12th and 16th volumes of the Society's Transactions; the first on the Formation of the Vegetable Epidermis, the second on the Development of the Seminal Germ, and the third on the Origin of Buds. Several papers on botanical subjects, from the pen of Mr. Keith, occur also in the Philosophical Magazine and Annals of Natural History.

Mr. Keith had long been suffering from severe illness, which terminated in his death on the 25th of January last, at the age of 71, at the parsonage of Stalisfield, in Kent, of which parish he had been for many years vicar. He was a native of Scotland, and received his education at the University of Glasgow.

William Kent, Esq.—Mr. Kent was a zealous botanist and horticulturist, and formerly possessed an extensive garden at Clapton, where, among many other choice plants, he successfully cultivated the beautiful *Nelumbium speciosum*, and other tender aquatics, of which he was a liberal distributor to his friends. His health obliging him to retire to Bath, he lost the means of indulging his inclination to horticulture on so large a scale; but of his garden on Bathwick Hill, it might truly be said that there never perhaps were so many rare plants cultivated together in so small a space. Notwithstanding he laboured under a painful complaint, he was also happily able to amuse himself by landscape painting; and at the same time he was ever active in promoting useful institutions, moral, scientific or literary.

Don Mariano Lagasca, Professor of Botany, and Director of the Royal Botanic Garden at Madrid, was a native of the province of Arragon, where his father followed the occupation of a farmer. He was sent at an early age to the Gymnasium of Tarragona, and after pursuing the course of study prescribed at that institution, he repaired to Madrid to complete himself for the medical profession, for which he had evinced a predilection. At Madrid he had the good fortune to attend the lectures, and to acquire the friendship, of the celebrated Cavanilles, at that time Professor of Botany in the Spanish capital, and these circumstances laid the foundation of the eminence to which he afterwards attained. In 1822, on the assembling of the Cortes, he was returned Deputy for his native province, and on the overthrow of the constitutional form of government in November of the following year, he was obliged to consult his safety by flight, first to Gibraltar, and afterwards to this country, where his high moral character, amiable disposition, and eminent talents, gained him universal esteem and respect.

Spain, long famed as the granary of ancient Rome, is known to surpa all other countries in the great variety of those grasses whic re cultivated for human food, such as wheat, barley, rye and

oats: and many of those whom I am now addressing may remember the extensive and interesting collection of Spanish *Cerealia* cultivated by Professor Lagasca in the garden belonging to the Society of Apothecaries at Chelsea. The publication of a 'Ceres and Flora Hispanica' had long been a favourite object with him, but which he did not live to accomplish. He departed this life in the 58th year of his age, on the 23rd of June last, at the palace of his early friend and school associate, the present Bishop of Barcelona, who hearing of his infirm state of health, had invited him to partake of his hospitality and kindness, in the hope that the milder air of Catalonia might be the means of restoring him. His remains were honoured with a public funeral, and an oration was pronounced over him by his friend Don Augustin Yanez, Professor of Natural History at Barcelona.

It was in Systematic Botany that Professor Lagasca had more particularly distinguished himself, and he has added greatly to our knowledge of various families of plants, such as *Umbelliferæ*, *Dipsaceæ* and *Compositæ*, of one of the groups of which, the *Labiatifloræ*, he may be regarded as the founder.

James Dottin Maycock, M.D.—Dr. Maycock is deserving of notice as the author of a Flora of Barbadoes, in which island he had long resided. The work forms a catalogue of the indigenous as well as cultivated plants of that island, and contains besides a number of interesting notices on their œconomical uses. The author has fully established the identity of the species which affords the Barbadoes aloes, with the *Aloe vulgaris*, accurately figured in the 'Flora Græca.'

William Mills, Esq.

Sir John St. Aubyn, Bart., F.R.S.—A distinguished cultivator of the science of Mineralogy, and who possessed one of the most extensive and valuable collections in that department of Natural History ever formed in this country.

James Sharpe, Esq.

The Rev. Thomas, Lord Walsingham.

Amongst the Foreign Members occur—

John Frederick Blumenbach, M.D., Professor of Medicine in the University of Göttingen, Foreign Member of the Royal Society of London, and Associate of the Royal Academy of Sciences of the French Institute, was pre-eminently distinguished by his important researches in General Anatomy and Physiology, which he continued to prosecute during a long life ardently devoted to the advancement of science. He was equally remarkable for the extent and variety of his knowledge and the philosophical sagacity of his views. Professor Blumenbach died on the 22nd of January last, at the advanced age of 88.

Joseph Francis, Baron Jacquin, Professor of Botany and Chemistry, and Director of the Imperial Gardens at Schœnbrunn, near Vienna, to which appointments he succeeded on the resignation of his father, the celebrated traveller and botanist. He was author of *Eclogæ Plantarum*, a folio work, containing descriptions and coloured figures of the new and rare plants which flowered in the gardens under his care, and also of a valuable work on birds.

Baron Jacquin possessed an amiable and obliging disposition, and was distinguished for his urbanity and kindness, especially to strangers; and few cultivators of science visited the Austrian capital without partaking of his good offices and hospitality. He died at Vienna, on the 10th of December, in the 74th year of his age.

The President also announced that seventeen Fellows and four Associates had been elected since the last Anniversary.

It was then moved by the President, and unanimously agreed to by the meeting, That the cordial thanks of the Society be given to Dr. Boott on his retirement from the office of Secretary, for the incessant attention which he has shown to the duties of that office, and the ability, zeal, and urbanity with which he has discharged those duties.

At the election, which subsequently took place, the Lord Bishop of Norwich was re-elected President; Edward Forster, Esq., Treasurer; John Joseph Bennett, Esq., Secretary; and Richard Taylor, Esq., Under-Secretary. The following five Fellows were elected into the Council in the room of others going out; viz. Thomas Bell, Esq., George Loddiges, Esq., Gideon Mantell, Esq., LL.D., Richard Horsman Solly, Esq., and Sir George Thomas Staunton, Bart.

June 2.—Mr. Forster, V.P., in the Chair.

Mr. George Francis, F.L.S., exhibited a portion of the trunk of the *Lepurandra saccidora* (Graham Cat. Bomb. Pl. p. 193.), from Western India, of the bark of which sacks and bags are made.

Mr. Rauch exhibited a specimen of the fruit of *Salisburia adiantifolia*, which ripened last year in the Imperial Gardens at Schoenbrunn, near Vienna.

Read, "On the reproductive Organs of *Equisetum*." By Mr. Joseph Henderson, Gardener to Earl Fitzwilliam, at Milton Park, communicated by the Rev. M. J. Berkeley, F.L.S. Mr. Henderson's observations were made on *Equisetum hyemale* and other species, and embrace the entire period of development of the sporæ and of the thecæ containing them. The theca is in the first instance filled with cells of extreme tenuity, in the interior of which the sporæ afterwards take their origin. After the appearance of the sporæ the containing cells gradually become thickened, and separate from each other; and at a still later period their walls are marked by spiral sutures, by means of which they are subdivided into two narrow bands with broad and rounded ends. As the sporæ approach maturity these bands separate at the sutures, and the containing cell is thus resolved into its component parts, the supposed filaments and antheræ of Hedwig. The sporæ, when ripe, have a double membrane, which is rendered evident by the addition of tincture of iodine. In the immature state of the thecæ, up to the time when the spiral lines become distinctly marked on the integument of the sporæ, they form transparent membranous reticulated bags, the meshes of which have different directions in different parts. When the sporæ have attained their full size, a new deposit of vegetable matter is added, and spiral vessels are formed within the flattened cells of which the membrane is composed, and the

outlines of which are indicated by the meshes on the surface. In some situations these vessels are true spirals, in others they partake more of the character of the annular.

While making these observations, Mr. Henderson was not aware that he had been in part anticipated by Treviranus, Bischoff and Meyen. They differ, however, in some particulars from the observations of those physiologists, who also differ from each other.

MISCELLANEOUS.

NOTE ON MR. HASSALL'S CATALOGUE OF IRISH ZOOPHYTES.

The following corrections upon the above communication, in our present Number, have been received from Mr. Hassall.

P. 169. "It is stated, that *Campanularia dumosa* is now ascertained to be the *Cornularia rugosa* of Cavolini—an opinion formerly held by Dr. Johnston and Mr. Gray. I have just been informed by the former that he is now assured it is *not* so."

P. 174. "Dr. Johnston considers *Melobesia pustulata* of Lamouroux, which is given, p. 174, as a synonym of *M. lichenoides*, to be this species in a *young* state; *Millepora lichenoides* Dr. J. also considers to be a condition of *Millepora polymorpha*, and that this again is nothing but the calcareous base of *Corallina officinalis*. To this I may further observe, that *M. lichenoides* is often found in situations in which the latter is, I believe, never met with; the one being usually adherent to fuci, the other always growing on rocks."—A. H. H.

OBITUARY:—PROF. WIEGMANN; MR. VIGORS.

We have the painful duty of recording the decease, during the past month, of N. A. Vigors, Esq., M.P., F.L.S., &c., whose exertions in the department of Zoology are well known;—and of Dr. A. F. A. Wiegmann, Professor in the University of Berlin, which sustains a heavy loss by his death. Our readers are aware of the great value of the 'Archiv für Naturgeschichte' conducted by him, of the contents of which we have often availed ourselves.

RED-BREASTED SNIPE.

We learn from Mr. J. H. Gurney that a specimen of the Red-breasted Snipe was killed near Yarmouth, early in October. Our informant adds, that it was a male, and had nearly completed its change from the summer to the winter plumage.

HOOPOE.—LITTLE STINT.

No. 7, Somerset Place, Stoke.

To the Editors of the Annals and Magazine of Natural History.

Gentlemen,—The following interesting facts are, I think, worthy of record in your Annals.

A very fine specimen of the Hoopoe was shot at Swansea the latter end of May last, and another specimen the latter end of last month; and yesterday, Sept. 7th, I was out shooting with a gentleman of this neighbourhood (the Rev. J. Hoar), when we succeeded in shooting no less than *ten* of the *Tringa minuta*, or Little

Stint; seeing a vast number more, which we were unable to get at, and invariably in company with the Dunlin or Purre. So many having been seen of this hitherto considered rare bird, is, I think, too interesting a fact not to be placed on record.—J. H. G. Gutch.

FOSSIL FISH.

In a description of a Fossil Dragon Fly from the lias of Warwickshire, in the Magazine of Nat. Hist. for June last, p. 301, I stated that one of the fossil fish, found in the same locality, "appears to be a Cycloid, and furnishes an exception to the generalization of M. Agassiz, that no cycloidian fish occurs below the chalk." I have since had an opportunity of showing this fish to M. Agassiz, who proved to me, that although the scales of this fish bear much resemblance at first sight to those of a Cycloid, yet that it is in fact a Ganoid of the genus *Pholidophorus*. The above generalization of M. Agassiz, therefore, remains as yet without an exception.—H. E. Strickland.

REMARKS ON A SPECIMEN OF KINGFISHER, SUPPOSED TO FORM A NEW SPECIES OF THE *TANYSIPTERA*.

The deception which is sometimes practised on naturalists by continental preparers of objects of natural history, is well exemplified by a specimen of a Kingfisher which was purchased in Paris, and is now before me. The specimen decidedly belongs to the genus *Tanysiptera*, of which there is but one species hitherto described, the *Tanysiptera Dea*, a bird rarely seen in collections, though the British Museum contains two good specimens. That to which I now wish to call the attention of ornithologists, differs much from the *Tanysiptera Dea*, both by the shortness of the central tail-feathers and by the richness of the several colours with which it is ornamented: and from these differences it was concluded to be a beautiful new species. But on examining the specimen carefully, some doubt arose as to the fact, whether it had not been, in part, at least, artfully dressed in its present showy plumage, from observing that the structure of some of the feathers was of a more downy nature, especially on the uropygium and beneath the body, than those usually covering the body of Kingfishers. This idea was rendered certain by the discovery that the wings were decidedly those of an *Alcedo Senegalensis*. The addition of wings and feet is not, however, uncommon in stuffed specimens of birds which come from New Guiana, as the natives prepare the skins without those parts, for use as ornaments, and from them the skins are procured and brought to Europe. A further examination proved that the downy feathers (which are of a rich salmon colour) of the uropygium, and most of those beneath the body, had been taken from a specimen of *Trogon Duvaucelii*; while on the sides these latter feathers are mixed with others from the neck of a young bird of *Alcedo leucocephala*, probably thus placed in order to diminish the probability of determining their identity. Having thus shown that all the under part is deceptively put together, it may reasonably be concluded that the feet

ly which the specimen is attached to its perch, have also been added to complete it.

Thus far I have referred to the defective portions, which must be decidedly considered as made up from the plumage of various birds, artificially intermingled, to give the appearance of a perfect specimen. I will now pass to the more pleasing task of noticing the parts which I think are those belonging to a distinct species. I will first, however, mention, that on comparing the feathers of these parts, as far as regards their structure, with those of the same parts of a well-authenticated specimen of *Tanysiptera Dea*, one is readily satisfied with their identity of character and disposition. But the differences of colouring between those portions which are left of the original bird and the same parts in the old species, will be better explained by the following description.

The tips of the feathers that compose the crest, as well as the elongated central tail-feathers, are ultramarine in this bird; while in the *Tanysiptera Dea* these parts are of a rich cobalt; in both, however, the tail-feathers are tipped with white.

The back is deep shining black in the present bird: but in the *T. Dea* that part is of a dull black, with each feather margined with deep blue.

The outer tail-feathers have the inner webs brownish black, and the exterior webs ultramarine: while in the *T. Dea* they are white, margined narrowly on the exterior edges with cobalt.

The central tail-feathers are much shorter than those of the *T. Dea*, though the size of the bird is nearly the same.

From these differences I may venture to give the following short specific characters of the bird before me, under the name of *Tanysiptera Nympha* :—

> Deep black above, margined with deep blue; the occipital crest and central tail-feathers ultramarine, the latter tipped with white; the lateral tail-feathers brownish black, with the outer webs ultramarine: beneath, &c.——?

I have two reasons for bringing this partly artificial bird before naturalists :—first, to call the attention of ornithologists to the fact that some of the continental preparers of objects of Natural History still continue the shameful practice of endeavouring to deceive the zealous collector by false means, as in bygone days, when several such were published in splendid works, that have since been discovered to be manufactured for the purpose of obtaining large sums of money from amateurs who were struck by their magnificent appearance: secondly, to point out, as far as such a specimen will admit, the existence, without doubt, of a second species of an extremely rare genus, and thus endeavour to lead to its further elucidation, in the hope of establishing the fact of the existence of more than one species. In further proof of the latter assertion, I may add, that I have seen another specimen, which differs in several respects from both those now mentioned, and may be an intermediate species between them, and which will be soon described by M. La Fresnage, of Paris.—George Robert Gray.

FOUNTAIN GUM BOTTLE.

I have found that the fountain inkstand, sold for Stephens's ink (but those sold by Mordan are probably as good), are the best vessels to keep gum-water in for common daily use. The fluid part of the gum-water being considerably above the level of the surface of the gum which is exposed for use, prevents it from becoming dry, as is so constantly the case in other kinds of vessels.—J. E. GRAY.

CARINARIA VITREA, LAMARCK.

Three specimens of this very rare shell have lately been brought to this country by Mr. Reeve, who purchased them at a sale in Holland. The shell of the unhatched animal (as is shown by the shell remaining on the apex of one of the specimens) is smooth, polished, nearly discoidal, and formed of several (three or four) slowly enlarging whorls, so as exactly to resemble the shell of the *Helix lucida* in form and appearance. When the animal is hatched, it suddenly enlarges its shell, and changes its form. The keel is formed of two distinct laminæ, one belonging to each side of the shell. In both these particulars, which I believe have not been noticed before, it exactly agrees with the more common *Carinaria Mediterranea*.—J. E. GRAY.

METEOROLOGICAL OBSERVATIONS FOR SEPT. 1840.

Chiswick.—Sept. 1, 2. Fine. 3. Rain. 4. Cloudy: rain. 5, 6. Fine. 7, 8. Very fine. 9. Hazy. 10—13. Very fine. 14. Hazy: heavy rain. 15. Cloudy: rain at night. 16. Rain, with brisk S.W. wind: barometer exceedingly low. 17. Very fine: frosty at night. 18. Frosty haze: very fine. 19. Cloudy and cool. 20. Fine. 21. Fine: rain. 22. Heavy rain. 23. Rain: clear and fine at night. 24. Heavy showers. 25. Cold and wet. 26. Overcast: rain. 27. Cloudy and fine. 28. Heavy rain. 29, 30. Clear and fine.

Boston.—Sept. 1. Cloudy. 2. Fine. 3. Rain: rain early A.M. 4—6. Fine. 7. Cloudy. 8. Fine. 9. Cloudy: rain early A.M. 10. Fine: rain early A.M. 11, 12. Fine. 13. Fine: rain P.M. 14. Cloudy. 15. Fine. 16. Fine: rain early A.M.: rain P.M. 17. Cloudy: rain early A.M. 18. Fine: rain P.M. 19, 20. Cloudy. 21. Cloudy: rain P.M. 22. Stormy and rain: rain A.M. 23. Rain: rain early A.M. 24. Fine: rain early A.M. 25. Rain: rain early A.M.: rain A.M. 26. Fine: rain P.M. 27. Fine. 28. Cloudy. 29. Fine: rain P.M. 30. Fine.

Applegarth Manse, Dumfries-shire.—Sept. 1. Fine harvest day: air electric. 2. Rain from midday. 3, 4. Showery. 5. Fine and clear. 6. Fine but cloudy. 7. Fine: a few drops of rain. 8. Cloudy A.M.: rain P.M. 9. Wet: cleared up: wet again. 10, 11. Occasional heavy showers. 12. Moist, but moderate. 13. The same: one shower. 14. Fine and clear. 15. Cold and showery. 16. Rain A.M. 17, 18. Very fine. 19. Fine A.M.: moist P.M. 20. Fine A.M. 21. Fine A.M.: showery. 22. Fine and dry: thunder A.M. 23. Rain. 24. Fine and fair. 25—27. Very wet. 28, 29. Moist. 30. Showery.

Sun shone out 28 days. Rain fell 21 days. Thunder 1 day.

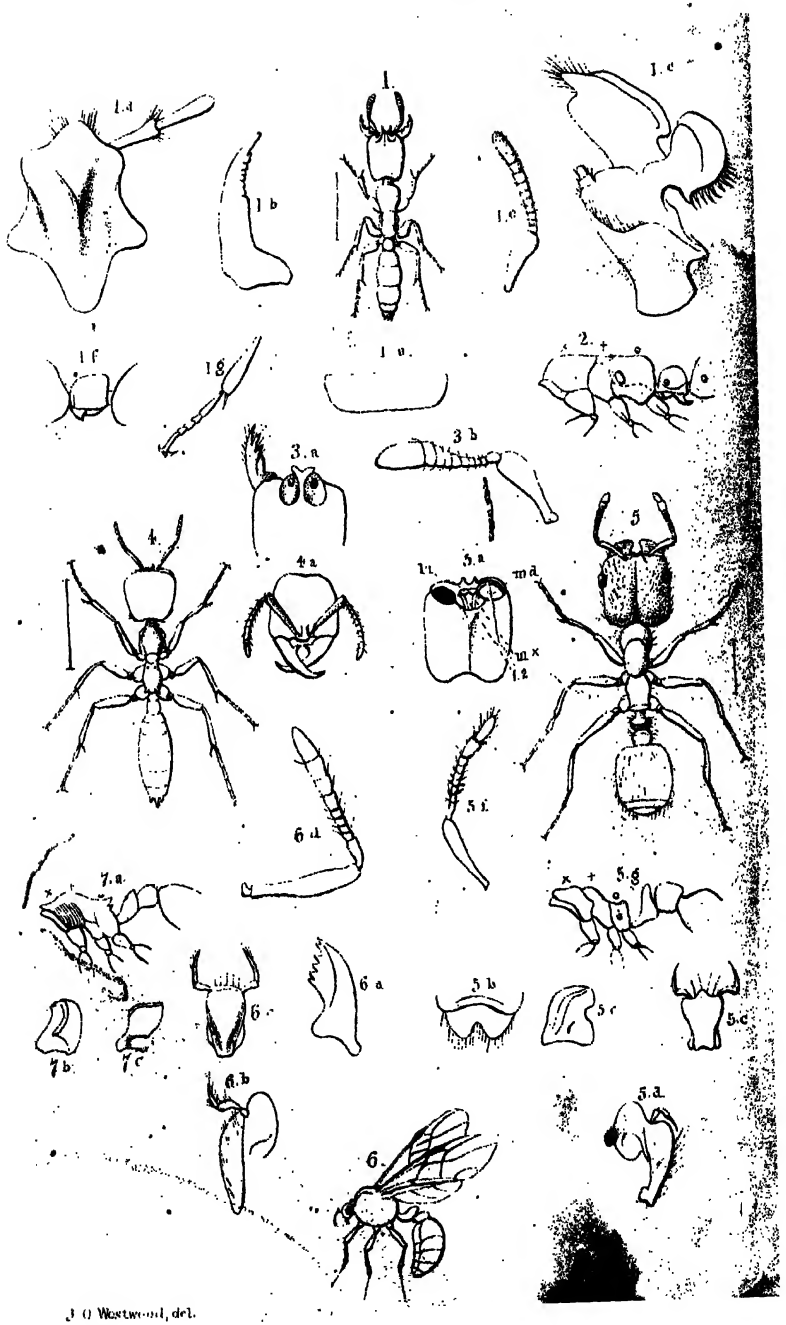
Wind north by east 1 day. North-east 3 days. East-north-east 3 days. East 3 days. South-east ½ day. South 5 days. South-south-west 1 day. South-west 9½ days. West-south-west 2 days. West 1 day. North-west 1 day.

Calm 6 days. Moderate 11 days. Brisk 5 days. Strong breeze 5 days. Boisterous 2 days. Variable 1 day.

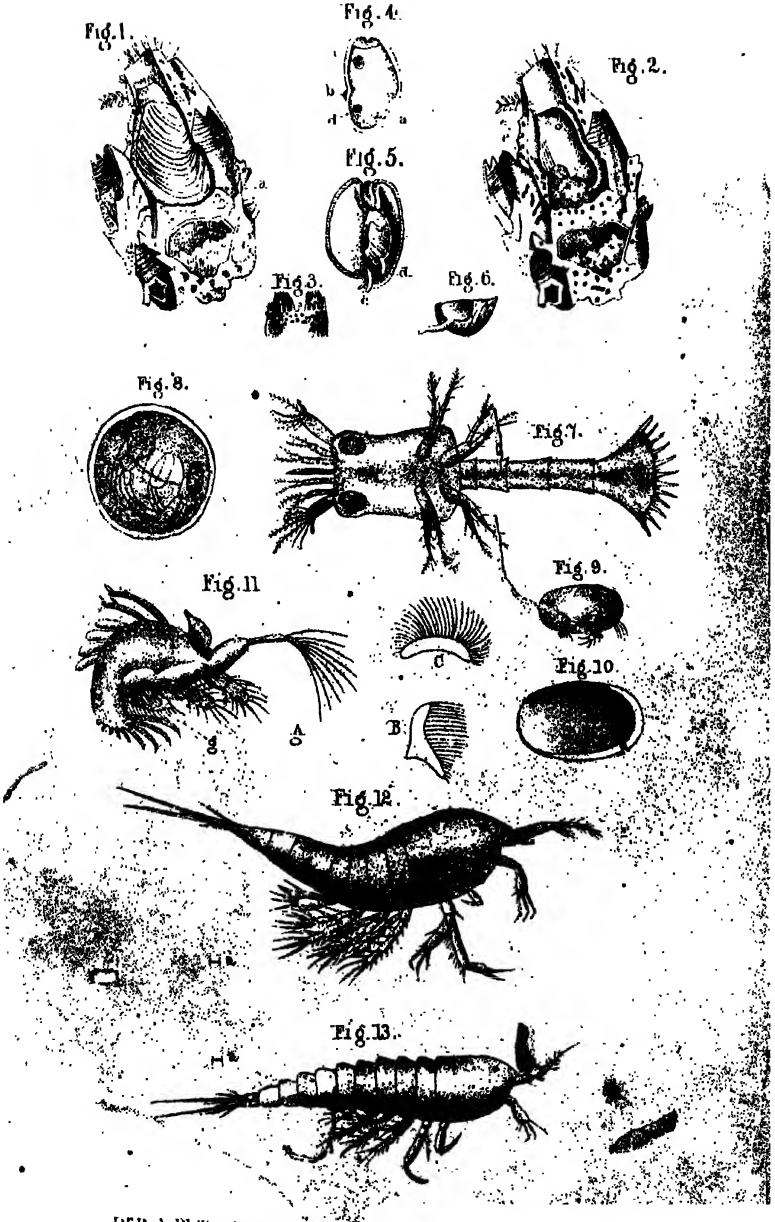
Mean temperature of the month ..... 50°·30
Mean temperature of September, 1839 ... 52 ·12
Mean temperature of spring water ..... 50 ·90

Meteorological Observations made at the Apartments of the Royal Society by the Assistant Secretary, Mr. ROBERTON: *by* Mr. THOMPSON *at the Garden of the Horticultural Society at Chiswick, near London; by* Mr. YEALL *at Boston, and by* Mr. DUNBAR *at Applegarth Manse, Dumfries-shire.*

Days of Month. 1840. Sept.	Barometer.						Thermometer.								Wind.			Rain.				Dew point.
	London: Roy. Soc. 9 a.m.	Chiswick.		Boston 9½ a.m.	Dumfries-shire.		London: Roy. Soc.		Chiswick.		Boston 9 a.m.	Dumfries-shire.			London: Roy. Soc. 9 a.m.	Chiswick 1 p.m.	Bost.	Dumfries-shire	London: Roy. Soc. 9 a.m.	Chiswick.	Boston.	Dumfries-shire.	Lond.: Roy. Soc. 9 a.m.
		Max	Min.		9 a.m.	8½ p.m.	Fahr. 9 a.m.	Self-register. Max.	Min.	Max.	Min.	Max	Min.										
1.	30·034	29·965	29·713	29·48	30·04	29·77	65·9	72·9	54·3	80	58	62	64	47½	N.	E.	E.	E.	...	...	...	...	65
2.	29·756	29·689	29·559	29·07	29·48	29·55	69·8	76·2	63·9	78	53	69	65½	51	S.	S.	calm	SE. SW	...	·22	...	...	66
☽ 3.	29·664	29·727	29·569	29·00	29·42	29·49	60·7	75·7	50·3	66	43	56	59	45½	W.	W.	calm	SW.	·236	·02	·21	...	61
4.	29·826	29·774	29·735	29·26	29·40	29·58	61·8	64·2	52·6	62	46	56	58	47	S.	SW.	W.	S.	...	·13	...	...	58
5.	30·012	30·063	29·927	29·44	29·75	29·95	60·0	64·8	51·2	68	40	57·5	58½	43½	W.	W.	calm	S.	·122	...	...	...	57
6.	30·276	30·196	30·112	29·50	30·03	29·90	59·8	67·2	50·8	74	53	62	59	44	S.	W.	calm	S.	...	...	...	...	55
7.	30·152	30·066	30·005	29·50	29·80	29·91	62·6	69·8	57·5	66	44	62	60	54	SW.	SW.	calm	SW.	...	·02	...	1·56	58
8.	30·180	30·105	30·073	29·58	29·78	29·78	58·4	68·0	52·5	71	51	58	57	44	NW.	W.	calm	WSW.	...	·01	...	...	56
9.	30·044	29·986	29·880	29·37	29·58	29·48	62·3	66·7	50·7	68	59	60	64	53	S.	S.	W.	SSW.	...	·02	·02	...	57
10.	30·014	29·962	29·917	29·35	29·69	29·70	61·5	68·0	60·7	72	45	59	59	48	WSW.	W.	W.	SW.	·041	...	·04	...	59
○ 11.	29·994	29·933	29·901	29·30	29·66	29·63	60·0	66·8	51·9	69	40	57·5	54½	45	SW.	W.	W.	WSW.	...	...	...	...	55
12.	30·024	29·968	29·894	29·38	29·64	29·74	56·8	65·3	47·2	66	35	54	56	45½	W.	W.	W.	SW.	...	...	...	...	52
13.	29·960	29·856	29·643	29·27	29·67	29·52	53·8	62·2	45·2	65	34	54	58	43½	SW.	W.	W.	W.	...	...	...	...	48
14.	29·474	29·455	29·197	28·05	29·31	29·21	54·3	60·7	46·0	54	43	48·5	53½	40½	S.	E.	calm	E by S.	...	·40	·01	0·50	49
15.	29·314	29·290	29·100	28·75	29·27	29·04	51·2	59·4	45·9	59	40	50	55	42½	W.	W.	SW.	S by E.	·283	·05	...	...	50
16.	28·892	29·079	28·744	28·31	28·76	29·02	55·7	60·8	46·9	57	43	50	54½	44	S.	SW.	W.	NE.	·130	·19	·31	...	49
17.	29·550	29·718	29·470	28·88	29·32	29·68	55·3	60·0	45·7	62	29	50·5	53½	44½	SW var.	W.	W.	NE.	·111	...	·06	...	48
☾ 18.	29·896	29·875	29·856	29·36	29·90	30·01	51·3	59·3	41·7	62	48	53	55	40	W.	SE.	N.	NE.	...	...	·05	...	45
19.	29·880	29·930	29·857	29·37	30·00	29·93	53·3	59·7	49·3	57	38	48·5	56	37½	NNW.	N.	N.	ENE.	...	...	·02	...	49
20.	30·036	30 002	29·995	29·50	29·87	29·80	51·3	56·6	42·4	62	32	48	54½	38	WNW.	W.	calm	SW.	...	...	...	...	44
21.	30·026	29·988	29·755	29·40	29·63	29·48	54·5	57·8	45·0	63	52	51·5	56	48	S.	S.	W.	SW.	...	·10	...	0·52	45
22.	29·500	29·497	29·482	28·87	29·20	29·15	55·2	62·5	52·4	53	40	51	56	42	S.	SW.	S.	E.	·083	·40	·22	...	50
23.	29·402	29·470	29·301	28·85	29·18	29·42	51·4	56·7	44·6	60	39	48	53	42	WSW.	S.	calm	ENE.	·533	·02	·07	...	45
24.	29·530	29·571	29·455	29·06	29·53	29·67	53·2	58·8	48·0	60	48	54	55	42	E.	W.	calm	S.	...	·26	·02	...	48
● 25.	29·796	29·984	29·702	29·30	29·83	29 94	50·2	59·3	50·0	57	35	52	57	35	NW.	N.	calm	S.	·097	·04	·47	...	49
26.	30·062	30·026	29·874	29·54	29·74	29·75	50·7	56·5	45·4	63	42	47	54½	41½	SW.	SW.	calm	SW.	·019	·16	·18	...	46
27.	30·014	29·967	29·899	29·36	29·62	29·60	55·4	60·6	49·0	65	49	54	53½	45	S.	W.	calm	SW.	·130	...	·13	...	48
28.	29·790	29·757	29·514	29·10	29·25	29·09	56·3	63·8	51·3	59	48	53	57	50	SE.	SW.	SW.	SW.	...	·30	...	...	52
29.	29·624	29·677	29·583	28·94	29·15	29·40	55·5	60·3	50·2	60	42	52	50½	46	S.	SW.	W.	SW.	·269	·01	·06	·096	53
30.	29·998	29·947	29·934	29·30	29 95	29·58	52 8	59·0	46·3	60	51	51	55	43	W.	W.	calm	SW.	...	...	·03	...	49
Mean.	29·821	29·817	29·686	29·21	29·575	29·589	57·3	65·3	50·0	63·93	44·03	54·5	56·6	44·4					Sum. 1·854	2·45	1·90	3·54	Mean. 52



J. O. Westwood, del.



Dr R. A. Philippi, ad. nat. del.

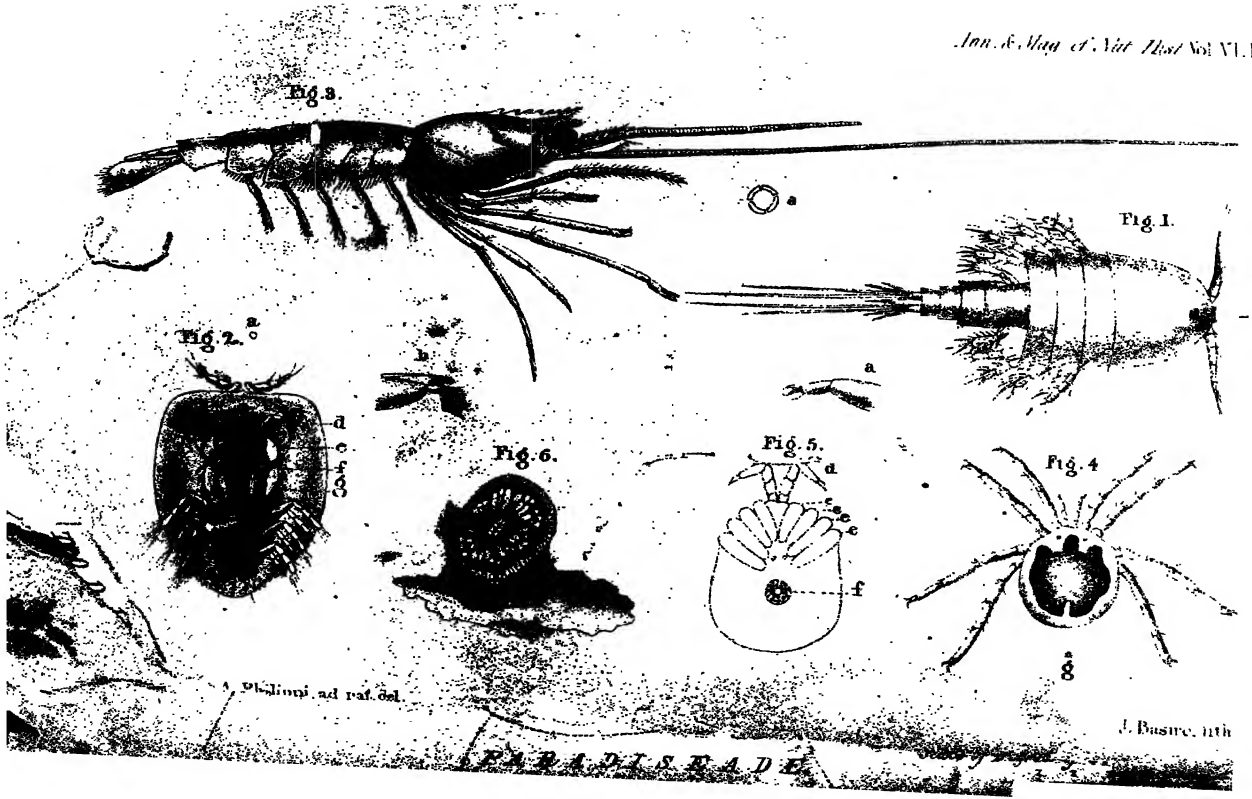


Fig.3.
Fig.1.
Fig.2.
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Fig.6.
Fig.5.
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Fig.4
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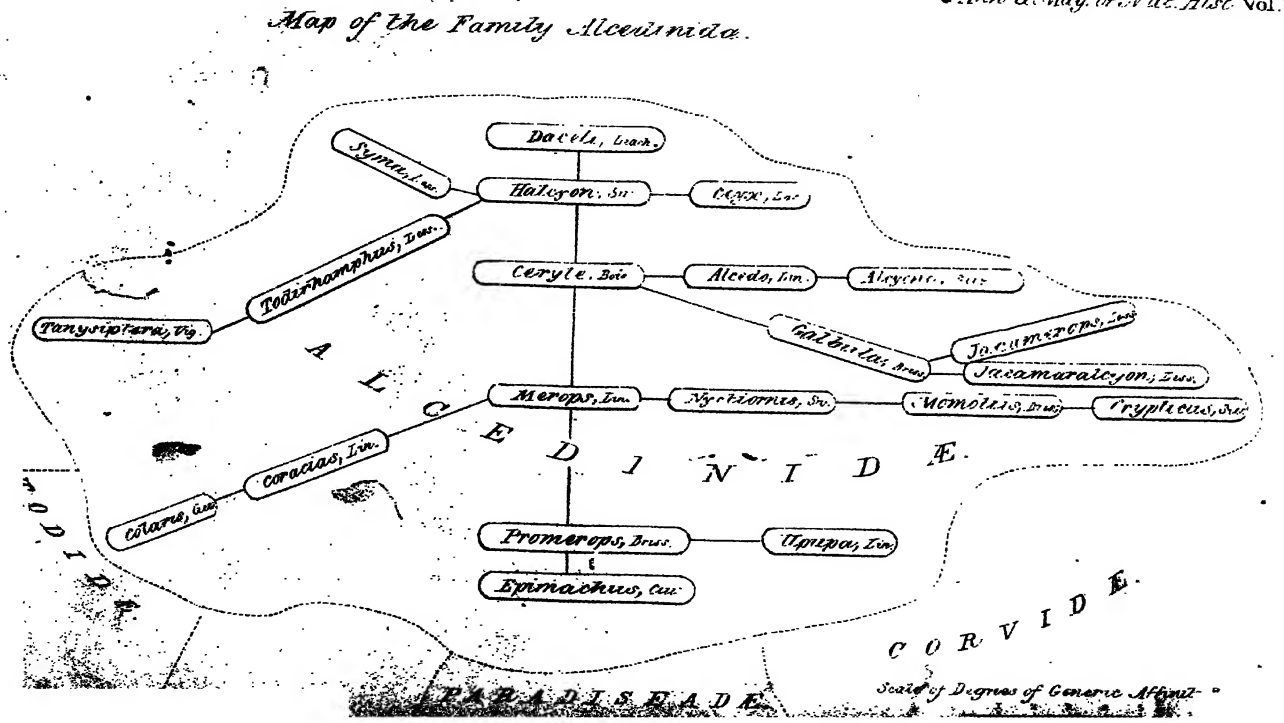
J. Basire, 11th
PARADISEADE


Map of the Family Alcedinidæ.
Dacelo, Leach.
Halcyon, Sw.
Ceyx, Lac.
Ceryle, Boie
Alcedo, Lin.
Alcyone, Sw.
Todirhamphus, Bon.
Tanysiptera, Vig.
Galbula, Briss.
Jacamaralcyon, Bon.
Merops, Lin.
Nyctiornis, Sw.
Momotus, Brisson
Coracias, Lin.
Colaris, Cuv.
Promerops, Brisson
Upupa, Lin.
Epimachus, Cuv.
ALCEDINIDÆ.
CORVIDÆ.
PARADISEADÆ.
Scale of Degrees of Generic Affinity.